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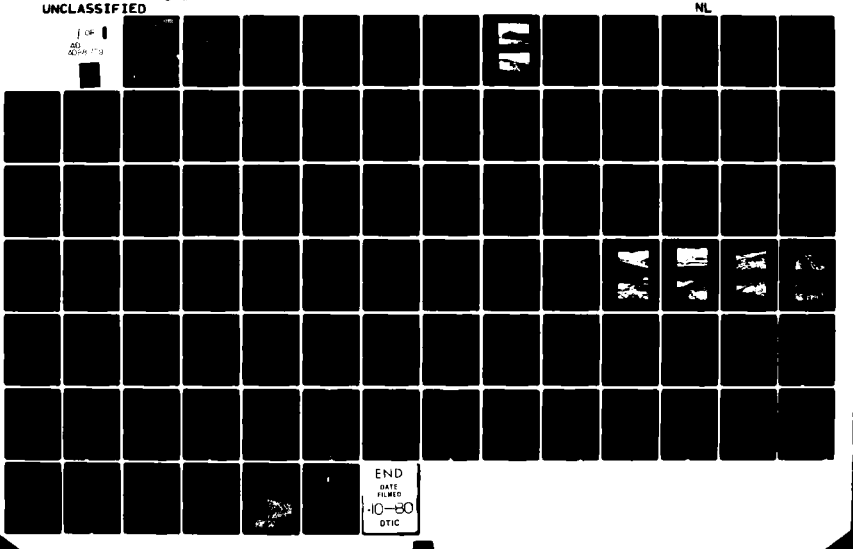

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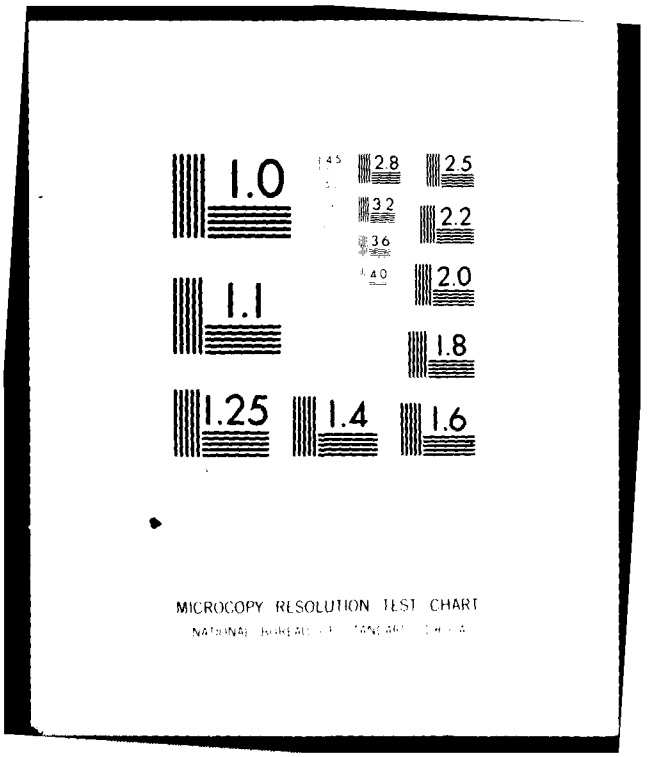
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LEVEL

OHIO RIVER BASIN

UNNAMED TRIBUTARY TO HARMON CREEK, WASHINGTON COUNTY

PENNSYLVANIA

PA 480

NDI No. PA 01125

PennDER No. 63-94

SCS No. PA 480

AD A088279

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

DACW31-80-C-0025

prepared for

DEPARTMENT OF THE ARMY

Baltimore District, Corps of Engineers

Baltimore, Maryland 21203

prepared by

MICHAEL BAKER, JR., INC.

Consulting Engineers

4301 Dutch Ridge Road

Beaver, Pennsylvania 15009

July 1980

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OHIO RIVER BASIN

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WASHINGTON COUNTY, COMMONWEALTH OF PENNSYLVANIA
NDI No. PA 01125
PennDER No. 63-84
SCS No. PA 480

(6) PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM.

Unnamed Tributary to Harmon Creek
NDI Number PA-01125. [illegible] Ohio River B[illegible]
Washington County, Pennsylvania.
Phase I Inspection Report

Prepared for: DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

Prepared by: MICHAEL BAKER, JR., INC.
Consulting Engineers
4301 Dutch Ridge Road
Beaver, Pennsylvania 15009

(11) 1 Jul 81

(15) DACW31-80-C-0025

(10) John A. Luzinski

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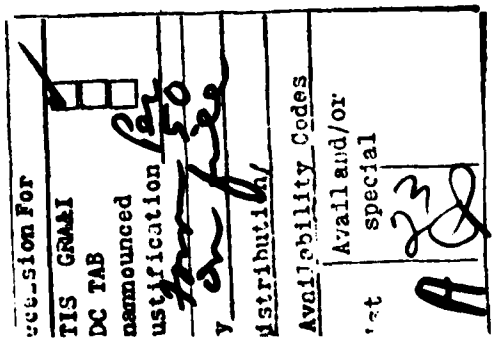
PREFACE

This report is prepared under guidance contained in the "Recommended Guidelines for Safety Inspection of Dams," for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.



PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

PA 480, Washington County, Pennsylvania
NDI No. PA 01125, PennDER No. 63-84, SCS No. PA 480
Unnamed Tributary to Harmon Creek
Inspected 27 March 1980

ASSESSMENT OF GENERAL CONDITIONS

PA 480 is classified as an "Intermediate" size - "Significant" hazard dam. The dam, owned by the Washington County Commissioners, is used to reduce floodwater damages in the Harmon Creek Watershed. The dam and appurtenant structures were found to be in good overall condition at the time of inspection.

Hydraulic/hydrologic evaluations, performed in accordance with procedures established by the Baltimore District, U.S. Army Corps of Engineers, for Phase I Inspection Reports, revealed that the spillway will pass the Probable Maximum Flood (PMF) without overtopping the dam. A spillway design flood (SDF) in the range of the 1/2 Probable Maximum Flood (1/2 PMF) to the PMF is required for PA 480. The 1/2 PMF was selected as the SDF. The spillway is therefore considered to be "adequate".

The visual inspection and review of information revealed only one problem which requires remedial action by the owners of the dam at the present time; namely, the repair of an erosion channel which has developed parallel to the rock gutter running along the downstream side of the embankment at the junction of the embankment and the emergency spillway.

It is also recommended that the slumping areas on the right abutment and the small slump at the downstream end of the emergency spillway be monitored in future inspections to ensure that these conditions do not become serious.

In addition, the following operational measures are recommended to be undertaken by the owner:

1) Develop a detailed emergency operation and warning system.

2) During periods of unusually heavy rainfall, provide around-the-clock surveillance of the dam.

3) When warning of a storm of major proportions is given by the National Weather Service, the owner should activate the emergency operation and warning system.

PA 480

Submitted by:

MICHAEL BAKER, JR., INC.

John A. Dziubek, P.E.
Engineering Manager-Geotechnical

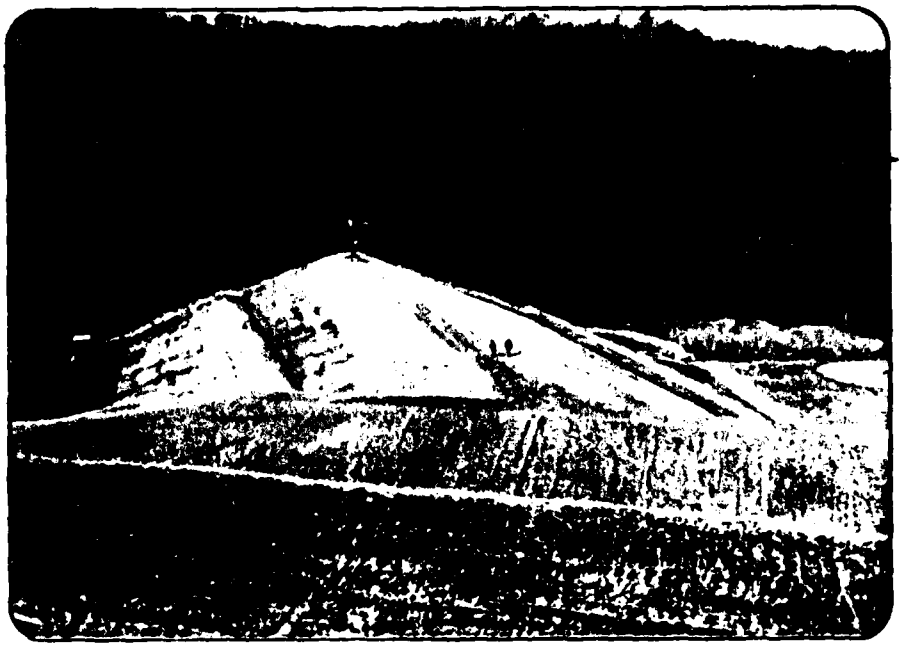
Date: 10 July 1980

Approved by:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

Date: 11 August 8



Overall View of the Upstream Face of the Dam from the Right Abutment

Overall View of the Downstream Face of the Dam from the Emergency Spillway

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APPENDICES

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
PA 480
NDI No. PA 01125, PennDER No. 63-84, SCS No. PA 480

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority - The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose of Inspection - The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances - PA 480 was designed by the U.S. Department of Agriculture, Soil Conservation Service (SCS) for floodwater detention. The total length of the dam is 555 feet, including the emergency spillway on the right abutment. The maximum height of the dam is 66 feet and the minimum crest elevation is 1010.0 feet Mean Sea Level (M.S.L.). The top width of the dam is 20 feet. The slope of the upstream face of the embankment is 3H:1V (Horizontal to Vertical) and the slope of the downstream face is 2.5H:1V. There are two benches on the upstream face of the embankment. The first is 18 feet wide and is located between Elevations 968.0 feet and 969.0 feet M.S.L. The second is 10 feet wide and is located between Elevations 990.9 feet and 991.8 feet M.S.L. There is also a 10 foot wide bench on the downstream side of the dam between Elevations 973.0 feet and 973.6 feet M.S.L.[1]

[1]These elevations correspond to the location of the benches at a cross-section taken through field inspection Station 1+29 on the top of dam profile (Appendix D). The benches have a 1 percent slope towards the left abutment so actual bench elevations vary along the dam. Field inspection stationing refers to the stationing used by Michael Baker, Jr., Inc. during the visual inspection. This stationing is shown on the field sketch. The SCS design stationing refers to the stationing found on the design plates in Appendix E.

The embankment was constructed using two zones of earthfill. The core section of the dam, zone I, consists of relatively impervious materials (CL, CH, and ML). This core has 2H:1V side slopes, a top width of 20 feet, and extends to Elevation 997.1 feet M.S.L. (12.9 feet below the design top of dam elevation, 1010.0 feet M.S.L.). The outer shell of the embankment, zone II, consists of fractured and weathered shale (classified GC) material. Zone II also consists of various materials excavated from the emergency spillway.

The drainage system for the embankment has several components: (1) a chimney drain between the downstream face of the zone I material and the zone II material, (2) a foundation drain trench, (3) a blanket drain, and (4) a toe drain (see Plate 7).

A grout curtain was placed in the right abutment in a zone of high permeability. This curtain extends for a total of 239 feet; from SCS design Station 5+46 to 7+85 (see Plate 8 for details).

The principal spillway is a drop-inlet structure consisting of a two-stage reinforced concrete riser connected to a 30 inch diameter reinforced concrete outlet pipe. The low-level inlet on the concrete riser is a 9 inch high by 15 inch wide orifice with an invert elevation of 968.0 feet M.S.L. This inlet maintains the normal pool level at Elevation 968.0 feet M.S.L. There is 25.1 acre-feet of storage at normal pool level, all of which is reserved for a 50-year accumulation of sediment.

The upper-level intake consists of two concrete overflow weirs with rounded downstream edges. The weirs are located on either side of the riser unit. The crest of these weirs is at Elevation 980.7 feet M.S.L., 12.7 feet above the invert of the low-level intake. Each weir is 7.5 feet long and there is a rectangular opening 1.25 feet high by 7.5 feet long above each weir. The openings to the upper and low-level intakes are protected by metal trash racks.

The 30 inch outlet pipe from the riser unit is 330 feet long and has 11 concrete anti-seep collars. The pipe exits into a concrete impact basin at the downstream toe of the embankment.

There is an 18 inch diameter reservoir drain pipe which extends from the base of the riser unit into the reservoir. The entrance invert of this pipe is at Elevation 948.2 feet M.S.L. The pipe is controlled by an 18 inch slide gate which is operated by a control located on the top of the riser unit.

The emergency spillway for the dam is located at the right abutment. It consists of a trapezoidal channel with a bottom width of 30 feet. The right side of the channel has a 2H:1V side slope and the left side has a 3H:1V side slope.

b. Location - PA 480 is located on an unnamed tributary to Harmon Creek, approximately 3.5 miles southwest of Burgettstown, Pennsylvania. The dam and reservoir are in Jefferson Township, Washington County, Pennsylvania and can be located on the Avella, Pennsylvania USGS 7.5 minute topographic quadrangle. The coordinates of the dam are N 40° 21.9' and W 80° 27.6'.

c. Size Classification - PA 480 has a maximum height of 66 feet and a top of dam storage capacity of 418.8 acre-feet. The dam is therefore in the "Intermediate" size category.

d. Hazard Classification - There are two frequently used railroad lines 1800 feet downstream from the dam. These lines and several homes located approximately 6000 feet downstream from the dam would suffer economic damage if the dam were to fail. No loss of life is likely to result from a dam failure. The dam is therefore in the "Significant" hazard category.

e. Ownership - The dam and reservoir are owned by the Washington County Commissioners, Washington County Courthouse, Washington, Pennsylvania.

f. Purpose of Dam - The dam is one of several floodwater retarding dams constructed by the SCS in the Harmon Creek Watershed. Its purpose is to reduce floodwater damages in downstream areas of the watershed.

g. Design and Construction History - Design of PA 480 was completed in 1965 by the SCS. Some minor revisions to the hydraulic design of the structure were made in 1971. Gal of Charleroi, Pennsylvania and Solomon-Teslovich of Masontown, Pennsylvania

were the contractors responsible for constructing the dam. Work was begun in March 1978 and fully completed in the spring of 1979.

h. Normal Operating Procedures - The pond is typically controlled by the low-level inlet of the riser structure at Elevation 968.0 feet M.S.L. Washington County and SCS personnel inspect the dam each year according to the procedures for annual inspections of SCS dams of this type. Washington County personnel perform routine maintenance on the dam.

1.3 PERTINENT DATA

a. Drainage Area (square miles) - 1.09

b. Discharge at Dam Site (c.f.s.) -

Peak Outflow at -	
Crest of Riser (El. 980.7 ft. M.S.L.) -	15.9
Crest of Emergency Spillway (El. 997.1 ft. M.S.L.) -	139
Design High Water (El. 1000.2 ft. M.S.L.)-	627
Top of Dam (El. 1010.0 ft. M.S.L.) -	6846
Maximum Flood of Record (El. 970.9 ft. M.S.L., date unknown) -	7

c. Elevation (feet above M.S.L.) -

Design Top of Dam -	1010.0
Maximum Design Pool -	1000.2
Emergency Spillway Crest -	997.1
Crest of Upper-Level Outlet -	980.7
Invert of Low-Level Outlet -	968.0
Normal Pool -	968.0
Exit Invert of Outlet Pipe -	944.0

d. Reservoir (feet) -

Length of Normal Pool (El. 968.0 ft. M.S.L.) -	815
Length of Maximum Pool (El. 1010.0 ft. M.S.L.) -	1700

e. Storage (acre-feet) -

Top of Dam (El. 1010.0 ft. M.S.L.) -	418.8
Maximum Design Pool (El. 1000.2 ft. M.S.L.)-	253.0

Crest of Emergency Spillway (El. 997.1 ft. M.S.L.) - 212.3
Normal Pool (El. 968.0 ft. M.S.L.) - 25.1[2]

f. Reservoir Surface (acres) -

Top of Dam (El. 1010.0 ft. M.S.L.) - 19.4
Maximum Design Pool (El. 1000.2 ft. M.S.L.)- 14.6
Crest of Emergency Spillway (El. 997.1 ft. M.S.L.) - 13.3
Normal Pool (El. 968.0 ft. M.S.L.) - 3.6

g. Dam -

Type - Zoned earthfill embankment
Length (feet) - 555
Height (feet) - 66
Crest Width (feet) - 20
Slopes - Upstream - 3H:1V. There is an 18 foot wide bench between Elevations 968.0 feet and 969.0 feet M.S.L. and a 10 foot wide bench between Elevations 990.9 ft. and 991.8 ft. M.S.L.
Downstream - 2.5H:1V with a 10 foot wide bench between Elevations 973.0 ft. and 973.6 ft. M.S.L.
Zoning - The inner core of the embankment (zone I) was constructed using relatively impervious materials (CL, CH, ML). This core has 2H:1V side slopes, a top width of 20 feet, and extends to Elevation 997.1 feet M.S.L. The outer shell (zone II) consists of fractured and weathered shale (classified GC) material. Zone II also consists of various materials excavated from the emergency spillway.
Cut-off - Zone I material was used to fill the cut-off trench which extends under the entire embankment. The trench is a minimum of 3.4 feet deep, has 2H:1V side slopes, and has a bottom width ranging from 12 to 25 feet.
Grout Curtain - A grout curtain was placed in the right abutment in a zone of high permeability. This curtain extends for

[2]This storage volume is reserved for a 50-year accumulation of sediment. It is not included in floodwater storage computations.

a total of 239 feet; from SCS design Station 5+46 to 7+85[3] (see plate 8 for details).

Drains - The drain system for the dam consists of a chimney drain between the downstream face of the zone I material and the zone II material, a foundation drain trench, a blanket drain, and a toe drain. Rock gutters were also placed at the junction of the embankment and emergency spillway and at the junction of the embankment and left abutment to provide surface drainage.

h. Diversion and Regulatory Tunnel - None

i. Spillway (Emergency Spillway) -

Type - Trapezoidal earth and rock cut channel at the right abutment

Length (feet) -	460
Bottom Width (feet) -	30
Side Slopes - Against Right Abutment -	2H:1V
Towards Dam -	3H:1V
Crest Elevation (feet M.S.L.) -	997.1

j. Regulatory Outlets (Principal Spillway) - The principal spillway is a drop-inlet structure consisting of a two-stage reinforced concrete riser connected to a 30 inch outlet pipe. The low-level inlet is a 9 inch by 15 inch orifice (invert Elevation 968.0 ft. M.S.L.). The upper level intake consists of two concrete overflow weirs (crest Elevation 980.7 ft. M.S.L.) with a total weir length of 15 feet. There is also an 18 inch reservoir drain pipe extending from the base of the riser unit into the reservoir. This drain pipe is controlled by an 18 inch slide gate which is operated by a control located on the top of the riser unit.

[3]The SCS stationing shown on the plate included in Appendix E differs from that shown on the field sketch prepared during the inspection. Unless specific reference is made to SCS stations, stations used in this report refer to the stationing shown on the field sketch and top of dam profile in Appendix A.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

PA 480 was designed by the SCS as a single purpose flood prevention structure. It is one of eight flood control dams in the Harmon Creek Watershed. It was designed to retard the 100-year frequency storm without discharge occurring in the emergency spillway.

PA 480 was designed according to standard SCS procedures for structures of this type. Information reviewed for this report included the following:

1) SCS Drawings No. PA 480-P, "Harmon Creek Watershed Project, Floodwater Retarding Dam PA 480, Brooke and Hancock Counties, West Virginia, Washington County, Pennsylvania," 43 sheets, 1976.

2) "Design Report, Site PA 480, Harmon Creek Watershed, Pennsylvania," U.S. Department of Agriculture, Soil Conservation Service, undated.

3) The correspondence file containing the permit application for the dam and inspection reports filed by the Pennsylvania Department of Environmental Resources' (PennDER) personnel during construction of the dam.

"As built" plans have not yet been completed for this dam.

2.2 CONSTRUCTION

PA 480 was built by Gal of Charleroi, Pennsylvania and Soloman-Teslovich of Masontown, Pennsylvania. Construction was begun in March 1978 and all work except for construction of the riser unit and placement of the rock gutters between the right abutment and embankment was completed by December 1978. This remaining work was completed in the spring of 1979.

No significant problems were reported by SCS or PennDER personnel during the construction of the dam.

2.3 OPERATION

The reservoir level is typically maintained by the low-level inlet of the riser structure at Elevation 968.0 feet M.S.L. Washington County and SCS personnel inspect the

dam each year according to the procedures for annual inspections of SCS dams of this type. Routine maintenance is performed by Washington County personnel.

2.4 EVALUATION

a. Availability - The information reviewed is readily available from the SCS office in Harrisburg, Pennsylvania and PennDER's File No. 63-84.

b. Adequacy - The information available is adequate for a Phase I inspection of this dam.

c. Validity - There is no reason at the present time to question the validity of the available information.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General - The visual inspection was performed on 27 March 1980. There had been relatively heavy rainfall in the area on the days immediately preceding the inspection. However, no unusual weather conditions were experienced during the inspection and the reservoir level was at Elevation 968.9 feet M.S.L., 0.9 foot above normal pool. The dam and appurtenant structures were found to be in good condition at the time of the inspection. Noteworthy observations made during the visual inspection are described in the following paragraphs. The complete visual inspection check list, field sketch, top of dam profile, and typical cross-section are presented in Appendix A.

b. Dam - The following is a list of the minor deficiencies observed during the visual inspection of the embankment and abutments.

1) There are several areas on the right abutment above the emergency spillway where there is some minor erosion and sloughing of the abutment slopes taking place. This problem is at least partially caused by groundwater seepage from the area behind the abutment and exposed zones of soft weathered mudstone. A number of small springs were observed on the abutment, all of which were flowing less than 1 g.p.m. This seepage had saturated the abutment slope in several locations. On the three benches above the emergency spillway, there was some ponded water which probably collected during recent rainfall. This condition is not believed to be a serious problem at the present time.

2) A small erosion channel has developed parallel to the rock gutter which runs along the downstream side of the embankment at the junction of the embankment and the emergency spillway.

3) Some ponded water was observed on the bench on the downstream side of the embankment. Several areas on the embankment below this bench were relatively saturated. Because the

bench was approximately 4 feet higher than the pool level at the time of the inspection, this water was probably the result of recent precipitation and not seepage through the embankment.

c. Appurtenant Structures - Both the concrete riser unit and impact basin were in good condition at the time of the inspection. There was a small slump at the downstream end of the emergency spillway.

d. Reservoir Area - The slopes of the reservoir and watershed are relatively steep. The area above the right abutment is the site of a strip mine. The remainder of the watershed is primarily forests with some pastureland.

There were several areas in the watershed where some sloughing of the steeper slopes had taken place. This should not present a significant problem for the dam or reservoir.

The dam was designed to provide storage for a 50-year accumulation of sediment. There was no evidence which indicated that sedimentation was occurring at a faster rate than that anticipated by the SCS.

e. Downstream Channel - The slopes of the downstream channel are moderate. There is a one-lane access road to the dam over the downstream channel approximately 200 feet downstream from the dam. Two 48 inch pipes carry flow under the road embankment. There are also 2 railroad lines 2000 feet downstream from the dam. The railroad lines are on embankments which are approximately 30 feet high. Flow under the embankments is carried by a 5 foot by 5 foot box culvert.

Several homes are located approximately 6000 feet downstream from the dam.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

The dam and appurtenances are inspected by Washington County and SCS personnel each year according to the procedures for annual inspections of SCS dams of this type. Formal maintenance and inspection procedures are presented in the "Erosion and Sediment Control Plan" for the dam.

4.2 MAINTENANCE OF DAM AND APPURTENANCES

Routine maintenance is performed periodically by Washington County personnel. Formal maintenance procedures are described in the "Erosion and Sediment Control Plan" for this dam. At the present time, maintenance of the dam and appurtenances is considered to be adequate.

4.3 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

An emergency warning procedure is being developed for PA 480. However, at the present time, no formal procedure is in effect.

4.4 EVALUATION OF OPERATIONAL ADEQUACY

The present operational and maintenance procedures for the dam are considered to be adequate. Formal emergency warning procedures should be developed and implemented.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data - Hydrologic and hydraulic design calculations for PA 480 were obtained from the SCS design report for this dam. The dam was designed to reduce floodwater damages in the Harmon Creek Watershed by retarding the 100-year frequency storm without discharge occurring in the emergency spillway. A sediment storage volume equal to a 50-year accumulation of sediment has been provided in the impoundment.

The design high water and top of dam elevations were determined by routing the emergency spillway and freeboard hydrographs developed by the SCS through the reservoir and dam. Both hydrographs were based on a storm duration of 6 hours. A summary of the rainfall and hydrograph data used in the design of the dam is presented in Appendix D.

b. Experience Data - During the brief lifetime of the structure, there have been no major floods reported in the watershed. The elevation of a high water mark on the riser unit, Elevation 970.9 feet M.S.L. indicates the highest reservoir level was 2.9 feet above normal pool. This corresponds to a discharge of 7 c.f.s. from the principal spillway. The date at which this reservoir level was reached is unknown.

c. Visual Observations - No conditions were observed during the visual inspection which would indicate that the dam and appurtenances could not perform satisfactorily during a flood event.

d. Overtopping Potential - PA 480 is an "Intermediate" size -"Significant" hazard dam requiring evaluation for a spillway design flood (SDF) in the range of the 1/2 Probable Maximum Flood (1/2 PMF) to the Probable Maximum Flood (PMF). Because of the small size of the drainage area and because the dam is on the low end of the "Intermediate" size category, the 1/2 PMF was selected as the SDF. The SCS has designed the dam using an SDF essentially equal to the PMF (see Appendix D). After reviewing the calculations prepared by the SCS and judging them to be accurate, it was determined that further hydrologic and hydraulic analysis was unnecessary.

e. Spillway Adequacy - The dam and reservoir, as outlined above, was designed based on a freeboard hydrograph essentially equal to the PMF. The spillway is therefore considered to be "adequate".

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations - The minor slumping of the right abutment and the slump at the downstream end of the emergency spillway do not represent a threat to the continued structural stability of the dam at the present time.

It is recommended that the seepage and sloughing of the right abutment be monitored during future inspections to ensure that these conditions do not become serious.

b. Design and Construction Data - Calculations of embankment slope and foundation stability were not available for review. However, a summary report from the SCS Soil Mechanics Laboratory at Lincoln, Nebraska dated 7 October 1971 presented the results of the laboratory soil testing program and slope stability analysis performed. Total stress shear strength parameters obtained and used in the slope stability analysis were reported as follows:

Foundation Materials -

Soil Type -	Clayey Sand (SC)
Type of Test Performed -	Direct Shear
Angle of Internal Friction (Ø) -	42°
Cohesion (C) -	200 p.s.f.
Sample Type -	Undisturbed Shelby Tube Sample

(Note: The shear parameters were reduced to Ø = 35° and c = 200 p.s.f. for the stability analysis to approximate the total stress shear parameters because the parameters from the slow direct shear test approach the effective stress values.)

Zone I (core) Embankment Materials -

Soil Type -	Weathered Shale (CL)
Type of Test Performed -	Consolidated Undrained Triaxial Shear Test
Angle of Internal Friction (Ø) -	20°
Cohesion (c) -	425 p.s.f.
Sample Type -	Minus No. 4 Sieve, Remolded and compacted at 100% Standard Proctor

Zone II (shell) Embankment Materials -

Soil Type -	Shale (CL)
Type of Test Performed -	Consolidated Undrained Triaxial Shear Test
Angle of Internal Friction (Ø) -	15.5°
Cohesion (c) -	425 p.s.f.
Sample Type -	Minus No. 4 Sieve, Remolded, and compacted at 95% Standard Proctor

The results of 12 stability calculations (using a Modified Swedish Circle Method) was presented. The resulting minimum factor of safety for the upstream slope under full drawdown conditions was 1.35 with an 18 foot wide berm at Elevation 968.0 feet M.S.L. and 3H:1V slope. The geometry of the upstream slope was later revised to include an additional 10 foot wide berm at Elevation 989.0 feet M.S.L. The resulting minimum factor of safety for the downstream slope (2.5H:1V) under steady state seepage was 1.48 with a 10 foot wide berm at Elevation 970.0 feet M.S.L. and a drain at c/b = 0.6 (or at a distance 0.6 times the base length of the downstream slope downstream from the vertical plane of the downstream edge of the crest of the dam). The embankment internal drainage design was later revised to place the drain at c/b = 0.7 and to include a chimney drain, a drainage blanket, and a toe drain. The chimney drain was installed primarily for additional stability.

Based upon the above information, coupled with the visual inspection, it is concluded that further stability assessments of the embankment are not necessary.

The right abutment consists of shale, siltstone, sandstone, and limestone. Some of the very soft, highly weathered shale and siltstone were considered to be a calcereous mudstone. These soft zones varied in thickness and slickensides were found in these deposits during the boring program. It was these soft zones which caused localized slumping and sliding in the emergency spillway after excavation because of fractures opening up due to rebound and change in the water table pattern. With time, additional slumping and sliding will occur in the emergency spillway area due to continued softening of the exposed areas of the mudstone. It is estimated that these localized slumps will not

interfere with the functioning of the emergency spillway but should be observed periodically to insure that the emergency spillway channel remains completely open.

c. Operating Records - Nothing in the operating information available indicates cause for concern relative to the structural stability of the dam.

d. Post-Construction Changes - No changes adversely affecting the structural stability of the dam have been performed.

e. Seismic Stability - The dam is located in Seismic Zone 1 of the "Seismic Zone Map of the Contiguous United States", Figure 1, page D-30, "Recommended Guidelines for Safety Inspection of Dams". This is a zone of minor seismic activity. Therefore, further consideration of the seismic stability is not warranted.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety - The dam and its appurtenant structures were found to be in good overall condition at the time of the inspection. PA 480 is an "Intermediate" size - "Significant" hazard dam requiring evaluation for an SDF in the range of the 1/2 PMF to PMF. Because of the relatively small size of the drainage area and because the dam is on the low end of the "Intermediate" size category, the 1/2 PMF was selected as the SDF. As was discussed in Section 5, the spillway and reservoir were determined to be of sufficient size to safely pass the SDF without overtopping the dam. The spillway is therefore considered to be "adequate".

b. Adequacy of Information - The information available is considered to be adequate for a Phase I Inspection Report.

c. Urgency - No urgent remedial work is required. The owners of the dam should undertake the minor repair item described in Section 7.2 as soon as possible.

d. Necessity for Additional Data/Evaluation - No conditions were observed during the inspection of this dam which would warrant additional evaluation at this time.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

The inspection revealed only one deficiency which should be corrected as soon as possible, namely, the repair of the erosion ditch described in paragraph 3.1.b., item 2.

It is also recommended that the slumping areas on the right abutment and the small slump at the downstream end of the emergency spillway be monitored in future inspections to ensure that these conditions do not become serious.

In addition, the following operational measures are recommended to be undertaken by the owner:

1) Develop a detailed emergency operation and warning system.

2) During periods of unusually heavy rainfall, provide around-the-clock surveillance of the dam.

3) When warning of a storm of major proportions is given by the National Weather Service, the owner should activate the emergency operation and warning system.

APPENDIX A

VISUAL INSPECTION CHECK LIST, FIELD SKETCH, TOP OF DAM PROFILE, AND TYPICAL CROSS-SECTION

Phase 1
Visual Inspection
Check List

Name of Dam PA 480 County Washington State PA Coordinates Lat. N 40° 21.9'

NDI # PA 01125
PennDER # 63-84
SCS # PA 480

Long. W 80° 27.6'

Date of Inspection 27 March 1980 Weather Sunny, clear Temperature 45° F.

Pool Elevation at Time of Inspection 968.9 ft.* M.S.L. Tailwater at Time of Inspection 944.8 ft.* M.S.L.

*All elevations are referenced to the top of the riser unit, El. 982.8 ft. M.S.L.

Inspection Personnel:

Michael Baker, Jr., Inc.:

James G. Ulinski
Wayne D. Lasch
George A. Slagle

Field Review (9 June 1980)

John A. Dziubek
James G. Ulinski

NOTE: During the field review the pool was at the elevation of the second stage (El. 980.7 ft.) because of blockage of the low-level orifice. The Washington County Administrator and the Washington County SCS office were notified of the condition in order to take corrective action.

James G. Ulinski Recorder

CONCRETE/MASONRY DAMS - Not Applicable

Name of Dam: PA 480
NDI # PA 01125

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
LEAKAGE		
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS		
DRAINS		
WATER PASSAGES		
FOUNDATION		

CONCRETE/MASONRY DAMS - Not Applicable

Name of Dam: PA 480
NDI # PA 01125

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES		
STRUCTURAL CRACKING		
VERTICAL AND HORIZONTAL ALIGNMENT		
MONOLITH JOINTS		
CONSTRUCTION JOINTS		

EMBANKMENT

Name of Dam PA 480
NDI # PA 01125

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	There are several areas on the right abutment above the emergency spillway where some minor erosion and sloughing of the abutment slopes have occurred. There is also a small slump at the downstream end of the emergency spillway. A small erosion channel has also developed parallel to the rock gutter which runs along the downstream side of the embankment at the junction of the embankment and the emergency spillway.	The minor sloughing of the right abutment is not considered to be a significant problem since the abutment has 11 ft. wide benches placed at three elevations. The small slump at the end of the emergency spillway is also not considered to be a significant problem at this time. The erosion channel should be repaired.

EMBANKMENT

Name of Dam PA 480

NDI # PA 01125

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	No problems were observed. See the top of dam profile at the end of this appendix.	
RIPRAP FAILURES	Riprap used in the drainage trenches on the embankment and in the discharge channel is in good condition. No problems were observed.	
VEGETATION	The embankment has a cover of grass, but the crown vetch and fescue has not yet developed.	

EMBANKMENT

Name of Dam PA 480
NDI # PA 01125

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	No problems observed	
ANY NOTICEABLE SEEPAGE	Several minor seeps were observed on the right abutment above the emergency spillway. These seeps, none of which were flowing more than 1 g.p.m., are the result of groundwater flow. There was some ponding of water on the bench on the downstream side of the embankment. There were also several areas on the embankment below this bench in which the soil was saturated.	Seepage from the right abutment is contributing to the sloughing and erosion of the abutment. While this does not represent a problem at this time, these seeps and their effects on the stability of the abutment slopes should be monitored in future inspections. The ponded water on the bench on the downstream side of the embankment and the areas in which the soil was saturated are also not believed to be significant problems.
STAFF GAGE AND RECORDER	None	
DRAINS	No flow from the drains was observed.	

OUTLET WORKS

Name of Dam: PA 480
NDI # PA 01125

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	All concrete surfaces were in good condition.	
INTAKE STRUCTURE	The intake structure was in good condition.	
OUTLET STRUCTURE	The concrete impact basin was in good condition.	
OUTLET CHANNEL	The outlet channel was clear of vegetation and debris. No problems were observed.	
EMERGENCY GATE	None	

UNGATED SPILLWAY

Name of Dam: PA 480
NDI # PA 01125

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	None	
APPROACH CHANNEL	The emergency spillway consists of a vegetated trapezoidal earth channel at the left abutment. The vegetation has not yet fully covered the channel area.	
DISCHARGE CHANNEL	There was a small slump at the end of the emergency spillway. This is not considered to be a problem at this time.	
BRIDGE AND PIERS	None	

GATED SPILLWAY - Not Applicable

Name of Dam: PA 480
NDI # PA 01125

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL		
APPROACH CHANNEL		
DISCHARGE CHANNEL		
BRIDGE AND PIERS		
GATES AND OPERATION EQUIPMENT		

INSTRUMENTATION - None

Name of Dam: PA 480

NDI # PA 01125

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS		
OBSERVATION WELLS		
WEIRS		
PIEZOMETERS		
OTHER		

RESERVOIR

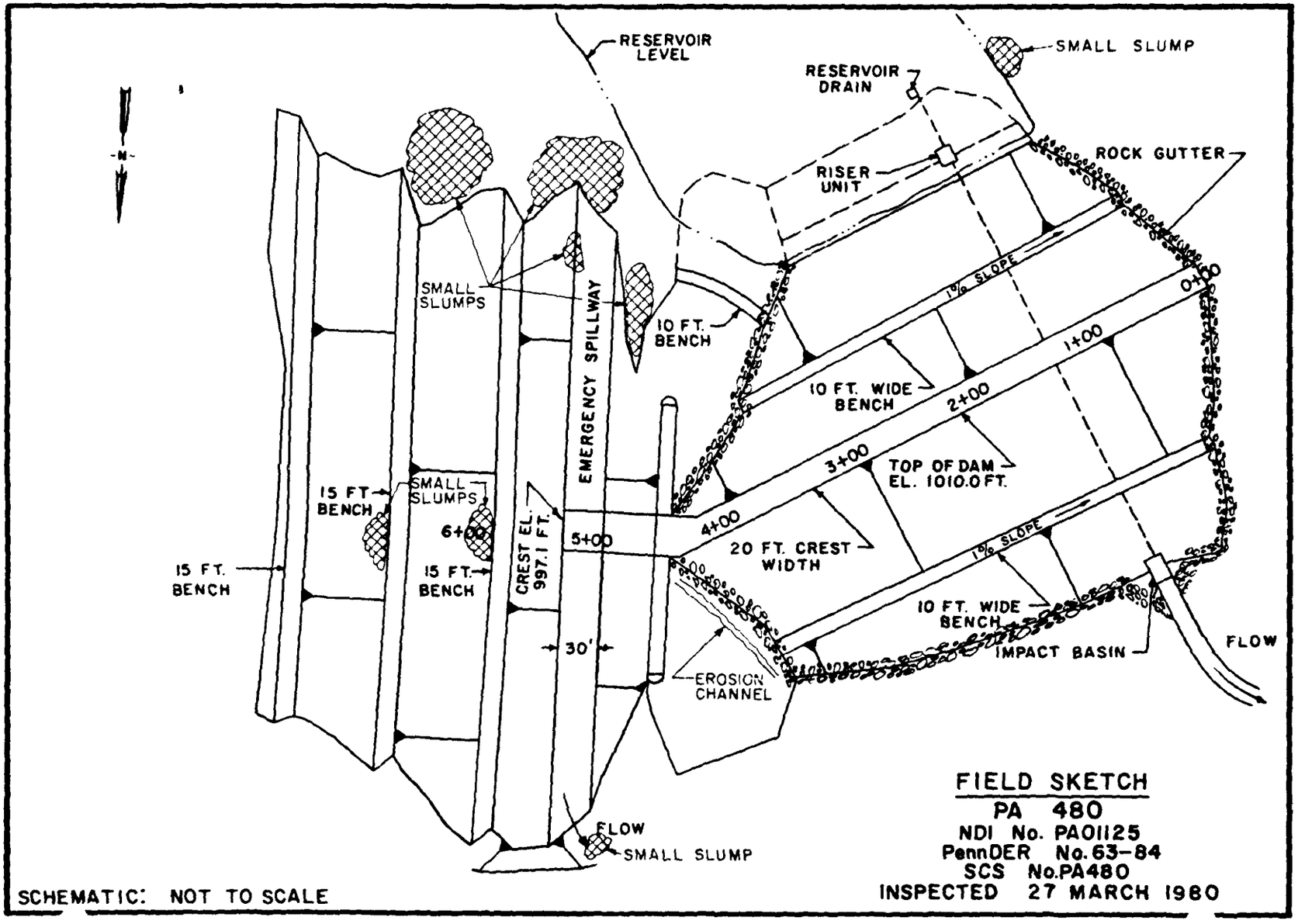
Name of Dam: PA 480
NDI # PA 01125

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	The slopes of the reservoir and watershed are relatively steep. There were several areas where sloughing of the slopes has occurred.	This is not considered to be a significant problem for the dam or reservoir.
SEDIMENTATION	The reservoir was designed to allow for a 50-year accumulation of sediment. There was no evidence to suggest that sedimentation was occurring at a rate faster than that anticipated by the SCS.	

DOWNSTREAM CHANNEL

Name of Dam: PA 480
NDI # PA 01125

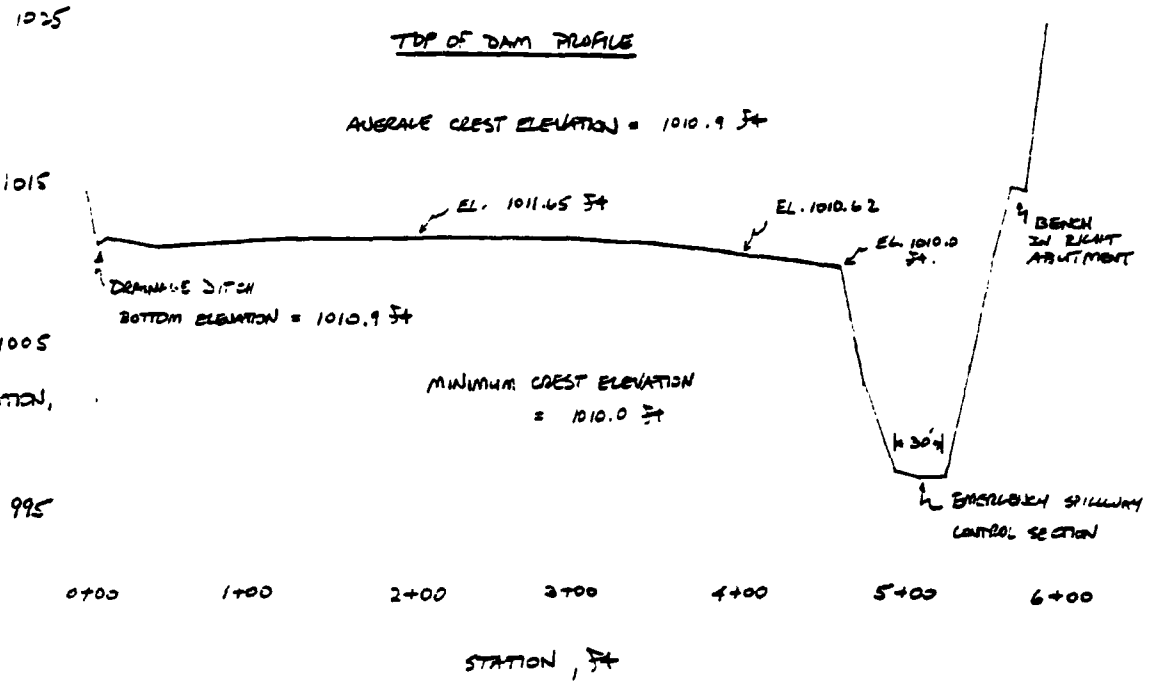
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	There is a one-lane bridge providing access to the dam over the downstream channel approximately 200 ft. downstream from the dam. Two 48 in. C.M.P.'s carry flow under the bridge. There are also two railroad lines approximately 2000 ft. downstream from the dam. The railroad lines are on embankments which are approximately 30 ft. high. Flow under the embankments is carried by a 5 ft. by 5 ft. box culvert.	
SLOPES	The slope of the downstream channel is moderate.	
APPROXIMATE NO. OF HOMES AND POPULATION	The closest homes are 6000 ft. downstream from the dam. Loss of life in these structures is not believed to be likely. There would be some economic damage to these homes.	

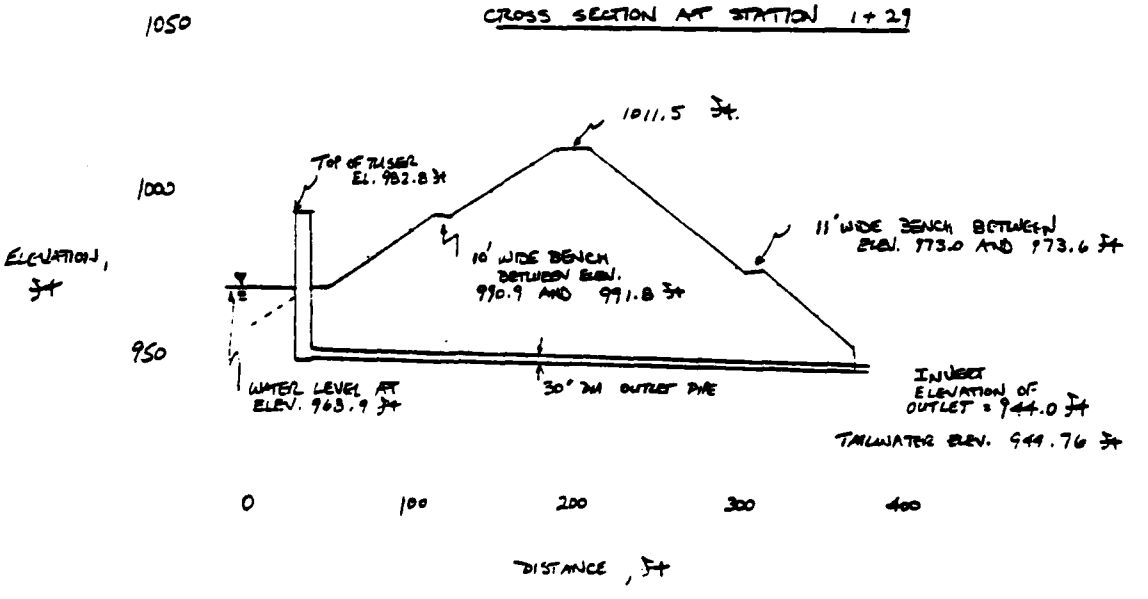

RESERVOIR LEVEL
SMALL SLUMP
RESERVOIR DRAIN
ROCK GUTTER
RISER UNIT
SMALL SLUMPS
10 FT. BENCH
EMERGENCY SPILLWAY
1% SLOPE
0+00
1+00
10 FT. WIDE BENCH
2+00
3+00
TOP OF DAM EL. 1010.0 FT.
15 FT. BENCH
SMALL SLUMPS
6+00
4+00
5+00
CREST EL. 997.1 FT.
20 FT. CREST WIDTH
15 FT. BENCH
15 FT. BENCH
1% SLOPE
10 FT. WIDE BENCH
IMPACT BASIN
FLOW
30'
EROSION CHANNEL
FLOW
SMALL SLUMP
SCHEMATIC: NOT TO SCALE
FIELD SKETCH
PA 480
NDI No. PA01125
PennDER No. 63-84
SCS No. PA480
INSPECTED 27 MARCH 1980

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS
28 April 1980
Box 280
Beaver, Pa. 15009

TOP OF DAM PROFILE
TYPICAL CROSS-SECTION

DATE OF INSPECTION - 27 March 1980





APPENDIX B

ENGINEERING DATA CHECK LIST

ENGINEERING DATA
CHECK LIST
DESIGN, CONSTRUCTION, OPERATION

Name of Dam: PA 480
NDI # PA 01125

ITEM	REMARKS
PLAN OF DAM	See Plate 3.
REGIONAL VICINITY MAP	The Avella, Pennsylvania USGS 7.5 minute topographic quadrangle was used to prepare the regional vicinity map included as Plate 1 in this report.
CONSTRUCTION HISTORY	Construction of the dam began in March 1978 and was completed in December 1978. The contractors involved in the construction of the dam were Gal, Charleroi, PA, and Solomon-Teslovich.
TYPICAL SECTIONS OF DAM	See Plate 5 and Appendix A, Sheet 14.
HYDROLOGIC/HYDRAULIC DATA	Design computations from the SCS design report for PA 480 were reviewed for this report. These computations are summarized in Section 5 and Appendix D.
OUTLETS - PLAN	See Plate 9.
- DETAILS and CONSTRAINTS	See Plates 10 and 11.
- DISCHARGE RATINGS	Discharge ratings were included in the SCS design report for this dam and are summarized in Appendix D.
RAINFALL/RESERVOIR RECORDS	None available

Name of Dam: PA 480

NDI # PA 01125

ITEM	REMARKS
DESIGN REPORTS	The SCS design report for PA 480 is available from the Harrisburg, PA SCS office.
GEOLOGY REPORTS	The required geology is presented in Appendix F. For a detailed report of the site geology, see the SCS design folder for PA 480.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	These analyses are contained in the SCS design report for PA 480.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	The results of foundation and borrow excavation tests are contained in the SCS design report for PA 480.
POST-CONSTRUCTION SURVEYS OF DAM	None
BORROW SOURCES	The majority of the borrow material used for construction of the embankment was taken from the area above the right abutment and from the emergency spillway excavation. Further specifications of the borrow material are contained in the SCS design report for this dam.

Name of Dam: PA 480

NDI # PA 01125

ITEM	REMARKS
MONITORING SYSTEMS	None
MODIFICATIONS	None
HIGH POOL RECORDS	The reservoir level has not yet risen to a significant amount above normal pool level.
POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None
MAINTENANCE OPERATION RECORDS	Maintenance and operation records are kept in accordance with the operation and maintenance agreement.

ITEM	REMARKS
SPILLWAY PLAN, SECTIONS, and DETAILS	See Plates 3 and 4.
OPERATING EQUIPMENT PLANS & DETAILS	The only operating equipment for the dam is the valve which controls the reservoir drain pipe. Its location is shown on Plates 9 and 10.

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 1.09 sq. mi. (Primarily forests with some strip mining activity)

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 968.0 ft. M.S.L. (25.1 ac.-ft.)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 997.1 ft. M.S.L. (212.3 ac.-ft.)

ELEVATION MAXIMUM DESIGN POOL: 1000.2 ft. M.S.L. (253.0 ac.-ft.)

ELEVATION TOP DAM: 1010.0 ft. M.S.L.

SPILLWAY: (Emergency Spillway)

a. Crest Elevation 997.1 ft. M.S.L.
b. Type Vegetated trapezoidal earth and rock cut channel
c. Bottom Width (Perpendicular to Flow) 30 ft. (bottom width)
d. Length of Spillway along Centerline (Parallel to Flow) 460 ft.
e. Location Spillover Right abutment
f. Number and Type of Gates None

OUTLET WORKS: (Principal Spillway)

a. Type 2 stage reinforced concrete riser
b. Location 125 ft. from the left abutment
c. Entrance Inverts El. 968.0 ft. M.S.L. (low-level intake); El. 980.7 ft. M.S.L. (upper-level intake)
d. Exit Inverts El. 944.0 ft. M.S.L.
e. Emergency Drawdown Facilities 18 in. drain pipe, entrance invert at El. 948.2 ft. M.S.L.

HYDROMETEOROLOGICAL GAGES: None

a. Type
b. Location
c. Records

MAXIMUM NON-DAMAGING DISCHARGE No records available

APPENDIX C

PHOTOGRAPH LOCATION PLAN AND PHOTOGRAPHS

DETAILED PHOTOGRAPH DESCRIPTIONS

Overall View -

Top Photo - (OV-T) Overall View of the Upstream Face of the Dam from the Right Abutment

Bottom Photo - (OV-B) Overall View of the Downstream Face of the Dam from the Emergency Spillway

Photograph Location Plan

Photo 1 - View of the Riser Unit, Reservoir, and Right Abutment

Photo 2 - View of the Impact Basin

Photo 3 - View of the Downstream Channel from the Crest of the Dam

Photo 4 - View of Water Collecting at the Toe of the Bench on the Downstream Site of the Embankment

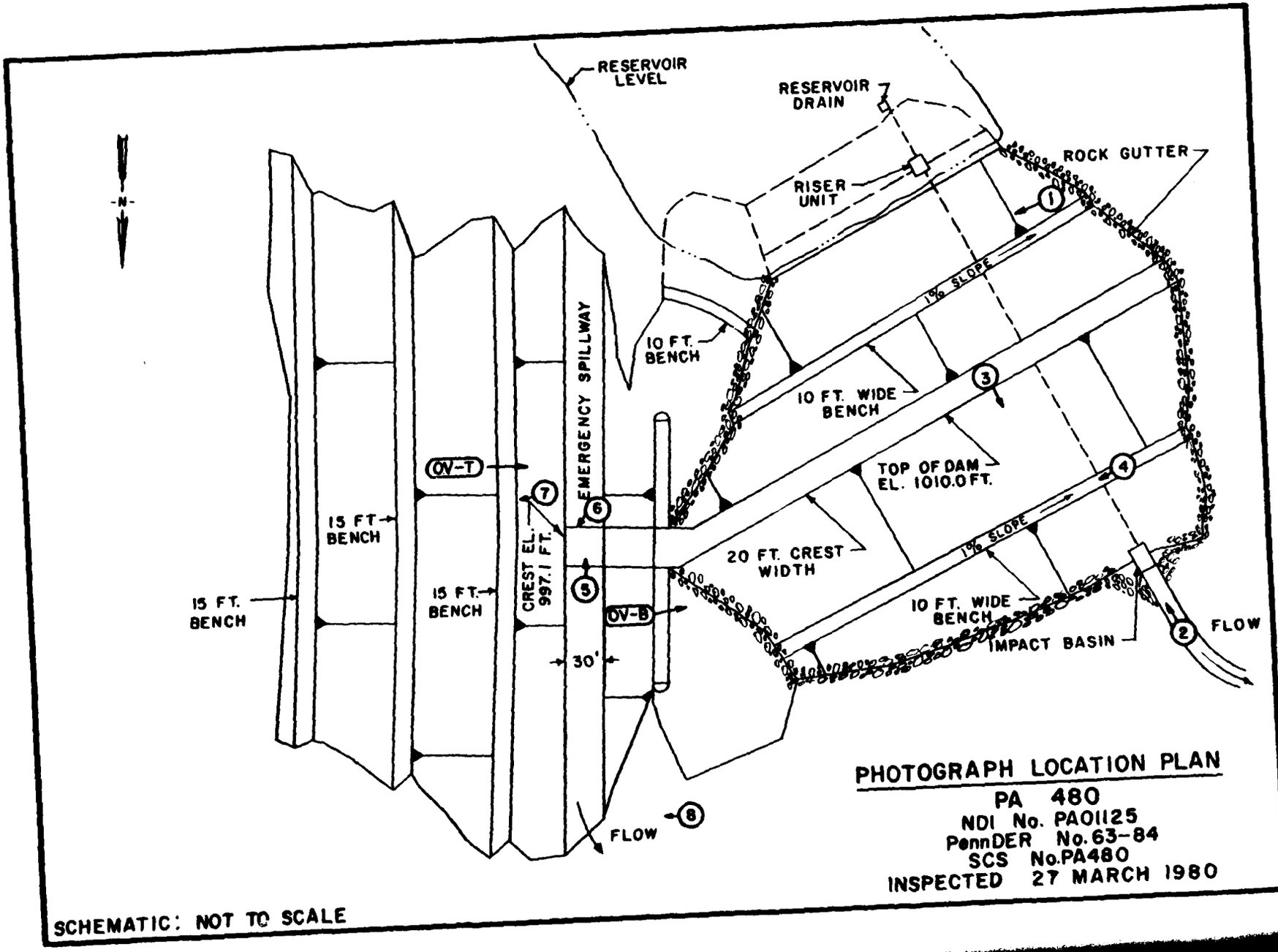
Photo 5 - View of the Emergency Spillway Looking Upstream

Photo 6 - View of the Slumping Area on the Right Side of the Emergency Spillway

Photo 7 - View of the Slumping Areas and Erosion on the Right Abutment Above the Emergency Spillway

Photo 8 - View of the Slumped Area at the Downstream End of the Emergency Spillway

Note: Photographs were taken on 27 March 1980.



PHOTOGRAPH LOCATION PLAN

PA 480
NDI No. PA01125
PennDER No. 63-84
SCS No. PA480
INSPECTED 27 MARCH 1980

SCHEMATIC: NOT TO SCALE

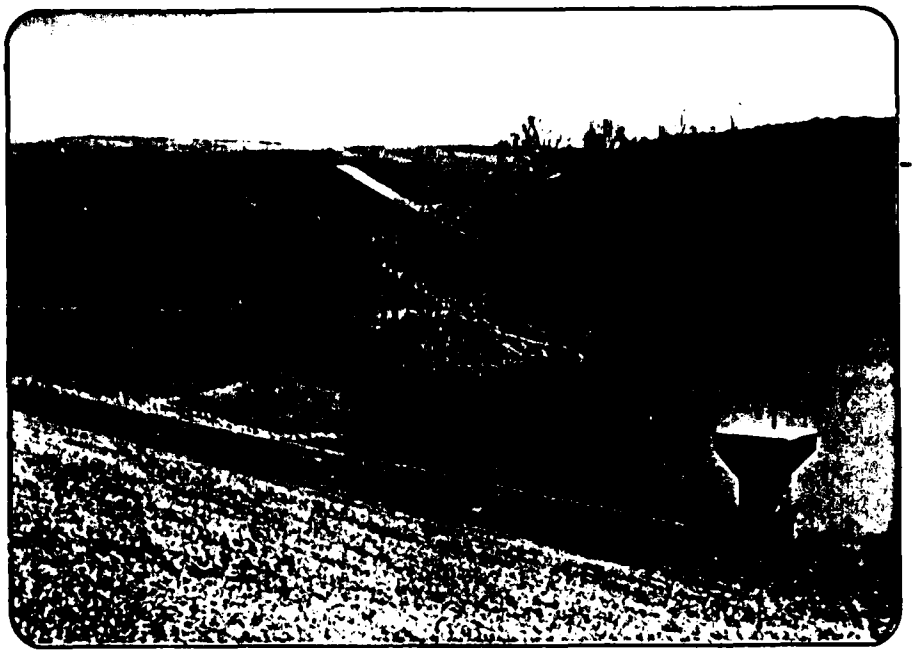


PHOTO 1. View of the Riser Unit, Reservoir, and Right Abutment

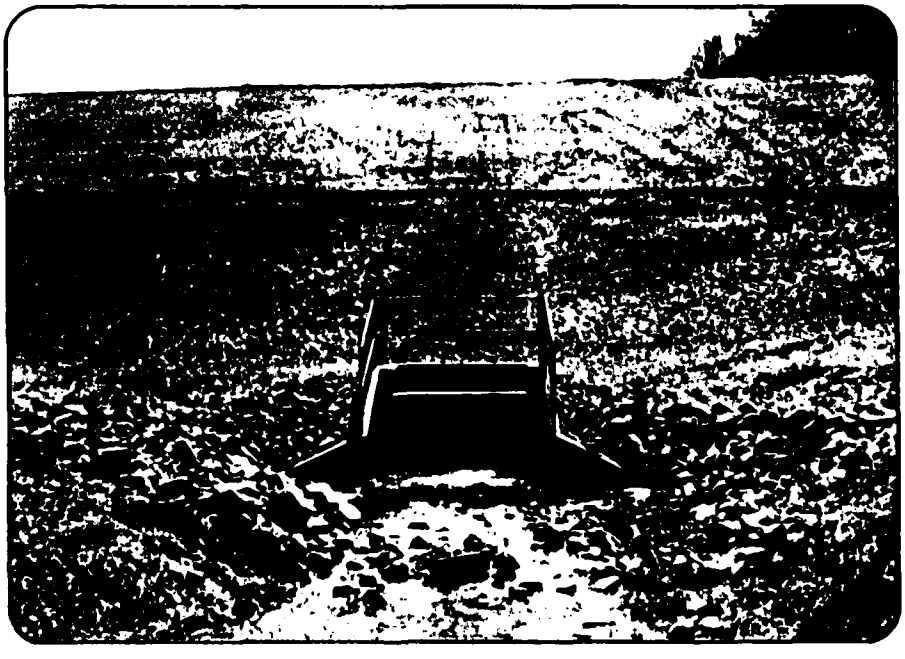


PHOTO 2. View of the Impact Basin

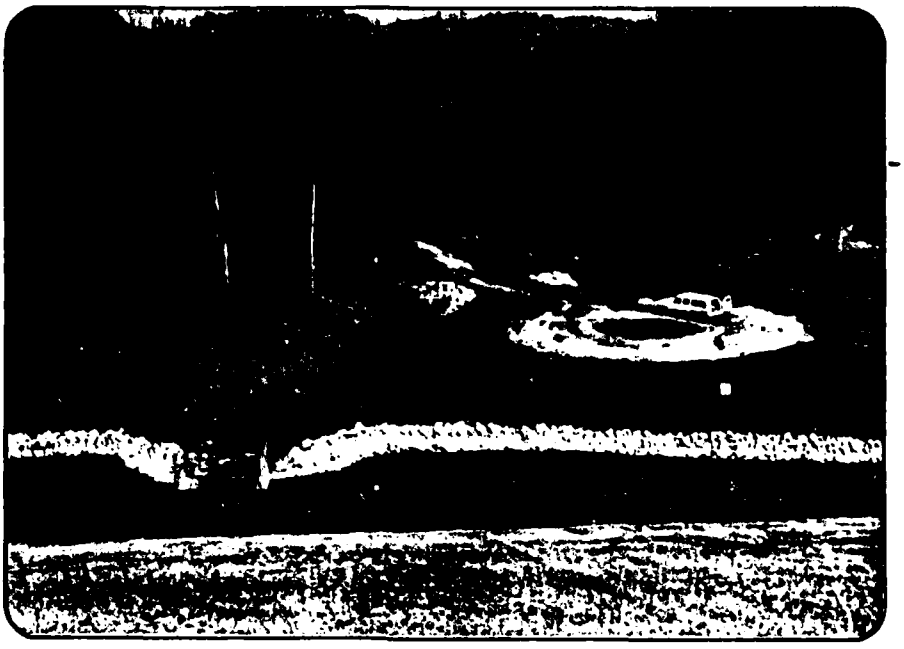


PHOTO 3. View of the Downstream Channel from the Crest of the Dam

PHOTO 4. View of Water Collecting at the Toe of the Bench on the Downstream Side of the Embankment

PHOTO 5. View of the Emergency Spillway Looking Upstream

PHOTO 6. View of the Slumping Area on the Right Side of the Emergency Spillway

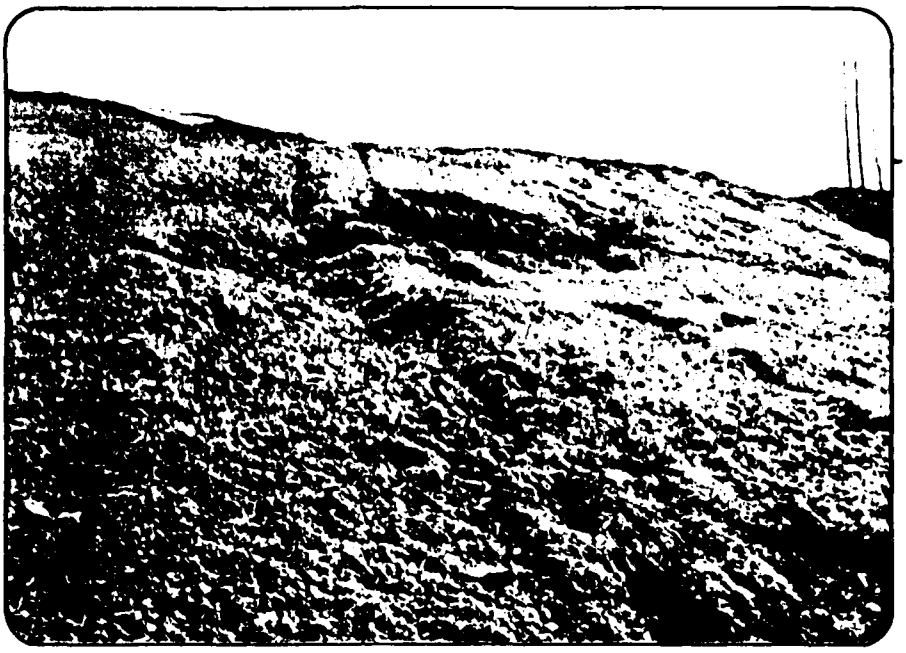


PHOTO 7. View of the Slumping Areas and Erosion on the Right Abutment above the Emergency Spillway

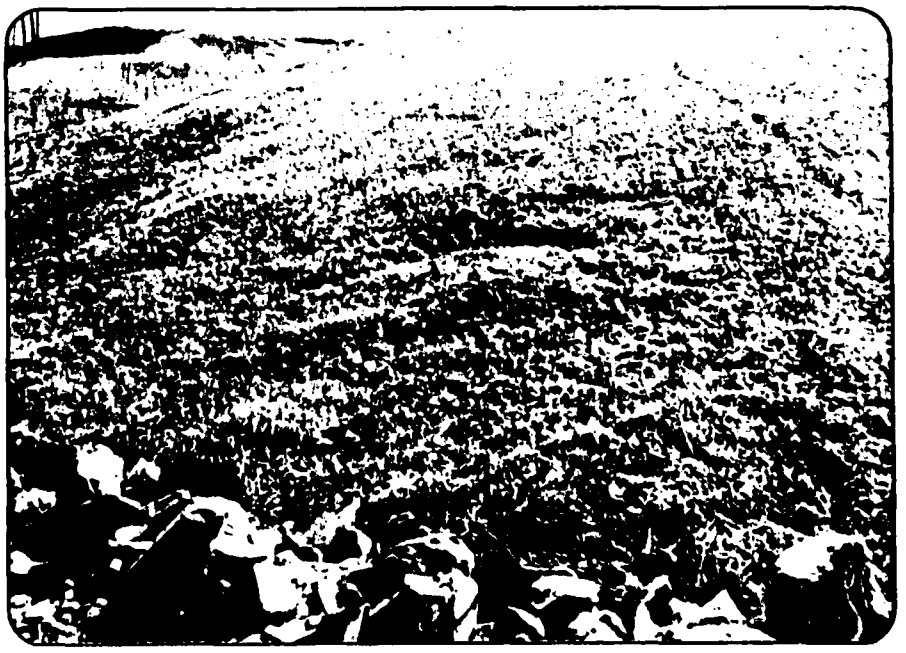


PHOTO 8. View of the Slumped Area at the Downstream End of the Emergency Spillway

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject PA-980 S.O. No.
APPENDIX D - HYDROLOGIC AND Sheet No. of
HYDRAULIC COMPUTATIONS Drawing No.
Computed by Checked by Date

HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: PA 480

PROBABLE MAXIMUM PRECIPITATION (PMP) = 24.1 INCHES/24 HOURS[1]

STATION	1	2	3	4	5
Station Description	PA 480				
Drainage Area (square miles)	1.09				
Cumulative Drainage Area (square miles)	1.09				
Adjustment of PMF for Drainage Area (%)[2]	Zone 7				
6 Hours	102				
12 Hours	120				
24 Hours	130				
48 Hours	140				
72 Hours	-				
Snyder Hydrograph Parameters					
Zone [3]	28B				
C_p/C_t [4]	0.57/1.7				
L (miles) [5]	1.44				
L_{ca} (miles)[5]	0.30				
$t_p = C_t (L \cdot L_{ca})^{0.3}$ (hours)	1.32				
Spillway Data					
Crest Length (ft)	(Spillway rating curve included on sheet 4)				
Freeboard (ft)					
Discharge Coefficient					
Exponent					

[1] Hydrometeorological Report 33 (Figure 1), U.S. Army, Corps of Engineers, 1956.

[2] Hydrometeorological Report 33 (Figure 2), U.S. Army, Corps of Engineers, 1956.

[3] Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's Coefficients (C_p and C_t).

[4] Snyder's Coefficients.

[5] L = Length of longest water course from outlet to basin divide.
L_{ca} = Length of water course from outlet to point opposite the centroid of drainage area.

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject PA-480 S.O. No.
REMARKS Sheet No. 2 of 6
Drawing No.
Computed by WDL Checked by Date 5-21-80

PA-480 WAS DESIGNED BY THE SCS IN ACCORDANCE WITH STANDARD CRITERIA. THE DESIGN FLOOD USED TO DETERMINE THE TOP OF DAM ELEVATION IS BASED ON RAINFALL ESSENTIALLY EQUAL TO THE PROBABLE MAXIMUM PRECIPITATION (PMP). THE DAM SHOULD THEREFORE BE CAPABLE OF PASSING THE PMF WITHOUT OVERTOPPING. IN VIEW OF THE ABOVE, NO ADDITIONAL HYDROLOGIC OR HYDRAULIC CALCULATIONS WERE PERFORMED FOR THIS REPORT.

THE SDF SELECTED IN SECTION 5 OF THIS REPORT IS THE 1/2 PMF. THE CREST OF THE EMERGENCY SPILLWAY WAS PLACED AT THE ELEVATION THE RESERVOIR LEVEL WOULD REACH DURING THE 100-YEAR FLOOD. THEREFORE, THERE WILL BE FLOW IN THE EMERGENCY SPILLWAY DURING THE SDF. USING SCS DESIGN INFORMATION, IT IS ESTIMATED THAT THE MAXIMUM DEPTH OF FLOW IN THE EMERGENCY SPILLWAY DURING THE 1/2 PMF IS 7.6 FT; THE MAXIMUM FLOW VELOCITY IS 7.8 FT/SEC, AND THE TOTAL DURATION OF FLOW IN THE EMERGENCY SPILLWAY IS APPROXIMATELY 6 HOURS. THE ROCK AND EARTH INTO WHICH THE EMERGENCY SPILLWAY IS CUT SHOULD NOT BE SERIOUSLY AFFECTED BY THIS FLOW.

THE SPILLWAY IS THEREFORE CONSIDERED TO BE "ADEQUATE" ACCORDING TO THE RECOMMENDED CRITERIA.

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject PA-480 S.O. No.
HYDROLOGIC DATA Sheet No. 3 of 6
Drawing No.
Computed by WDL Checked by Date 5-21-80

INFORMATION FROM THE SCS DESIGN REPORT FOR PA-480:

DRAINAGE AREA = 1.09 SQ. MI.

TIME OF CONCENTRATION = 0.61 HRS.

STORM DURATION = 6 HRS.

RUNOFF CURVE NUMBERS:

DESIGN HYDROGRAPH (AMC III) CN = 88
FREEBOARD HYDROGRAPH (AMC II) CN = 74

HYDROGRAPH	RAINFALL (IN)	RUNOFF (IN)	PEAK INFLOW (CFS)
EMERGENCY SPILLWAY	9.7	6.47	645
FREEBOARD	25.5	21.72	6876

FROM HMR-33, 6 HOUR PMP = 24.6 IN.

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject PA - 480 S.O. No.
STAGE VS. STORAGE, AREA DATA Sheet No. 4 of 6
Drawing No.
Computed by WDL Checked by Date 5-21-80

THE FOLLOWING INFORMATION IS FROM THE SCS DESIGN REPORT FOR PA-480 :

STAGE (FT)	STORAGE (ACRE-FT)	AREA (ACRES)
968.0	0	3.6
970.0	6.8	4.14
975.0	28.5	5.04
980.0	56.1	6.53
985.0	91.5	8.12
990.0	136.0	10.21
995.0	191.3	12.43
1000.0	258.1	14.50
1005.0	337.0	17.06
1010.0	428.0	19.36
1015.0	531.0	22.08

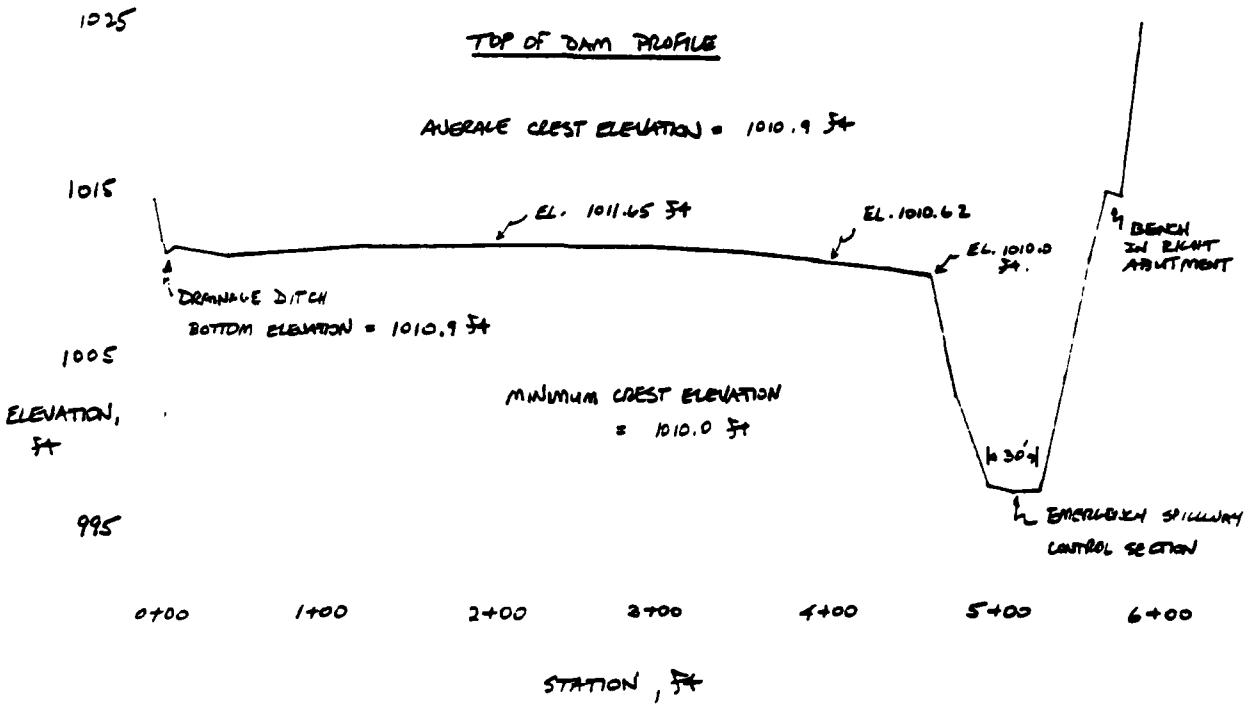
DISCHARGE RATING

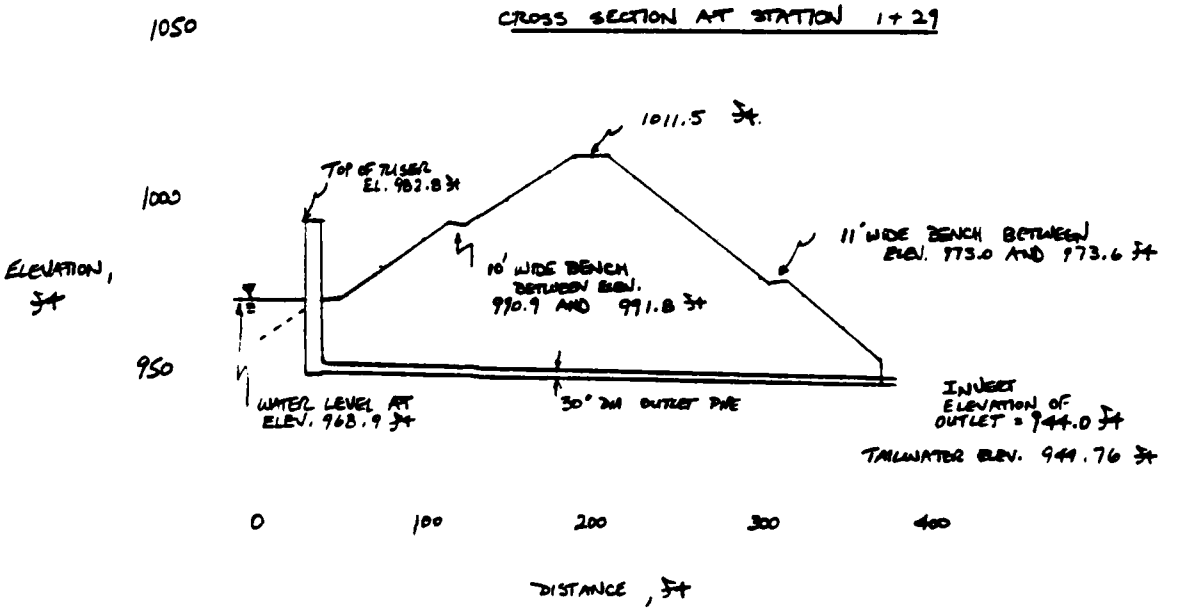
STAGE (FT)	DISCHARGE (CFS)	REMARKS
968.0	0	NORMAL POOL ELEVATION
970.0	5.77	
975.0	11.7	
980.0	15.4	
980.7	15.9	CREST OF UPPER LEVEL INTAKE
985.0	122.16	
990.0	129.22	
995.0	135.2	
997.1	138.7	CREST OF EMERGENCY SPILLWAY
1000.0	142.3	
1000.2	627	DESIGN HIGH WATER
1002.0	1635	
1010.0	6846	TOP OF DAM

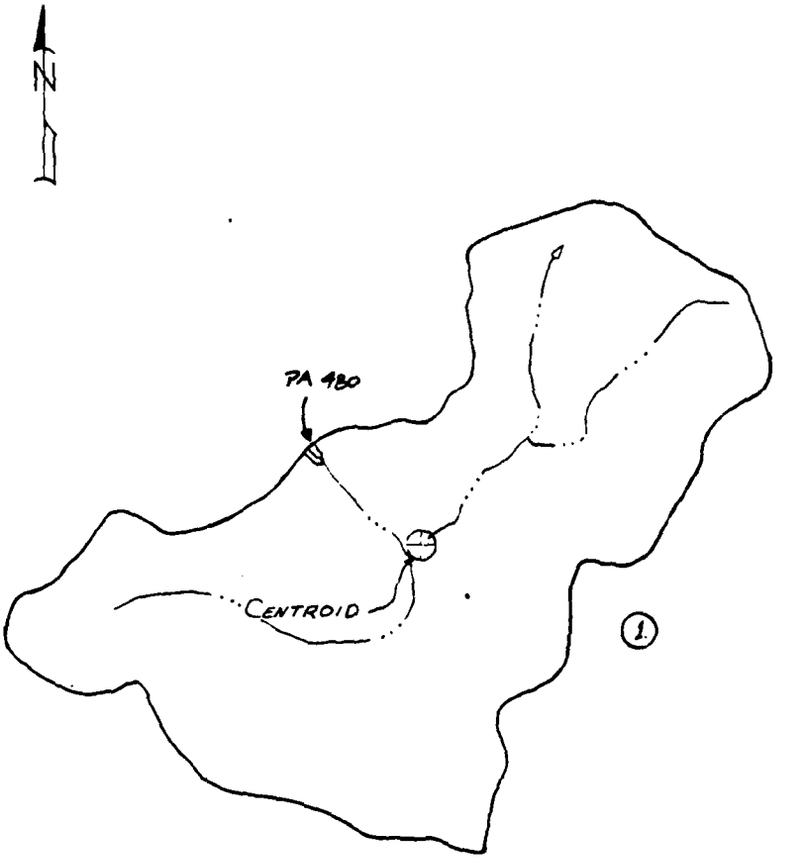
MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject PA 480 S.O. No.
TOP OF DAM PROFILE AND Sheet No. 5 of 6
TYPICAL CROSS-SECTION Drawing No.
Computed by WDL Checked by Date 4-28-80







DRAINAGE BASIN MAP
PA. 480

QUADS :

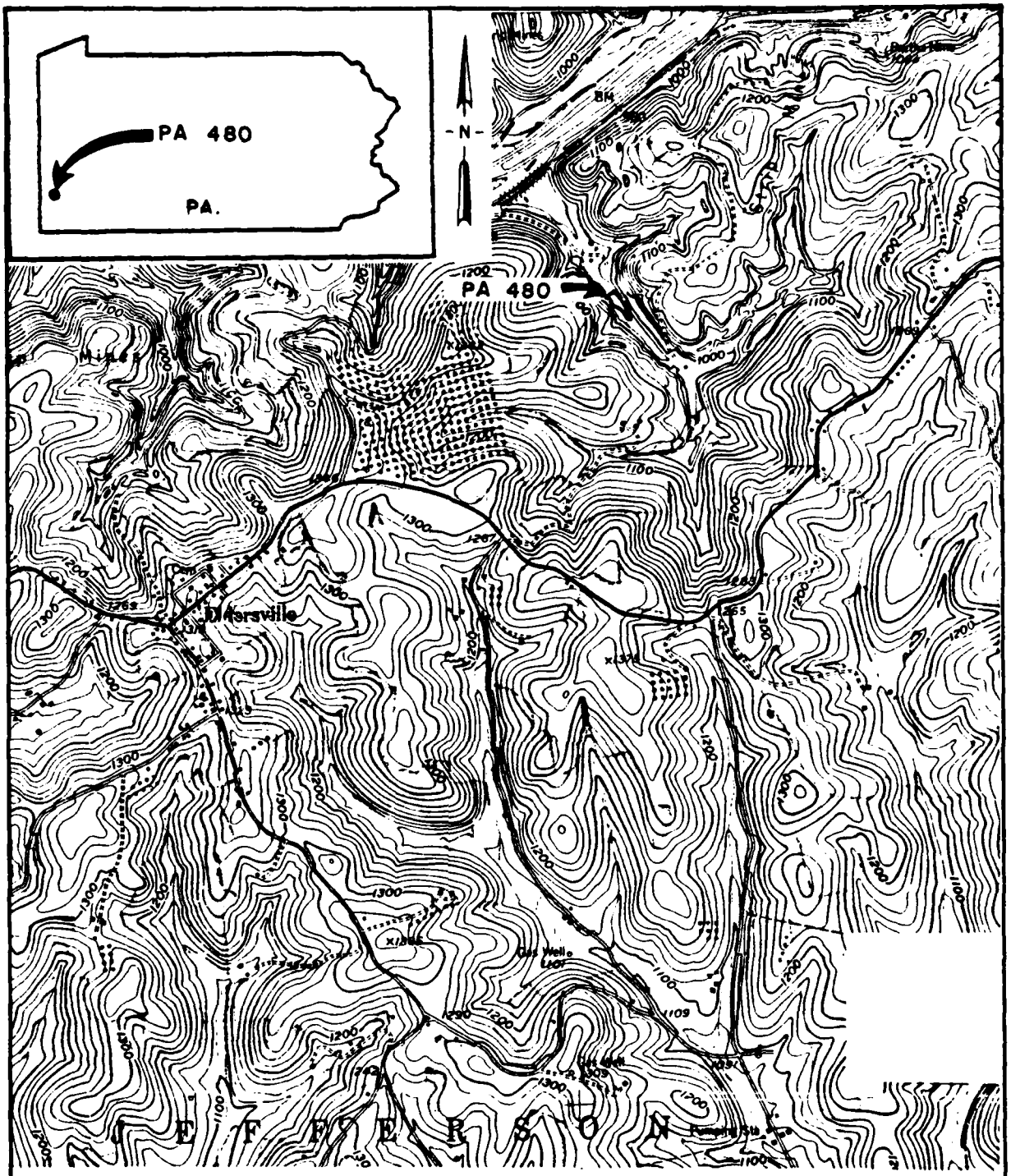
1. AVELLA

2000 0 2000 4000
SCALE

APPENDIX E

PLATES

CONTENTS



SCALE 1:24000

1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

PLATE 1

LOCATION PLAN

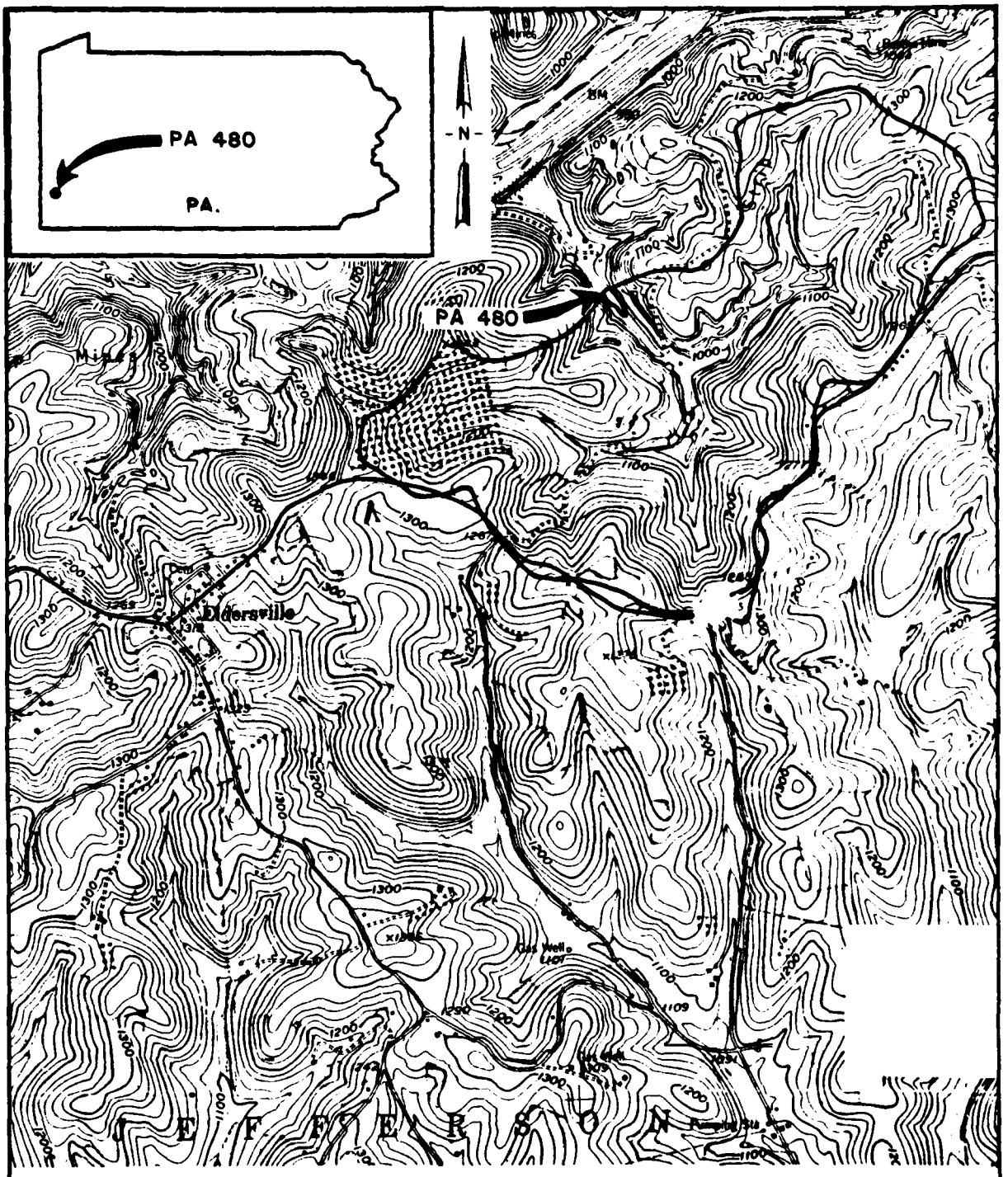
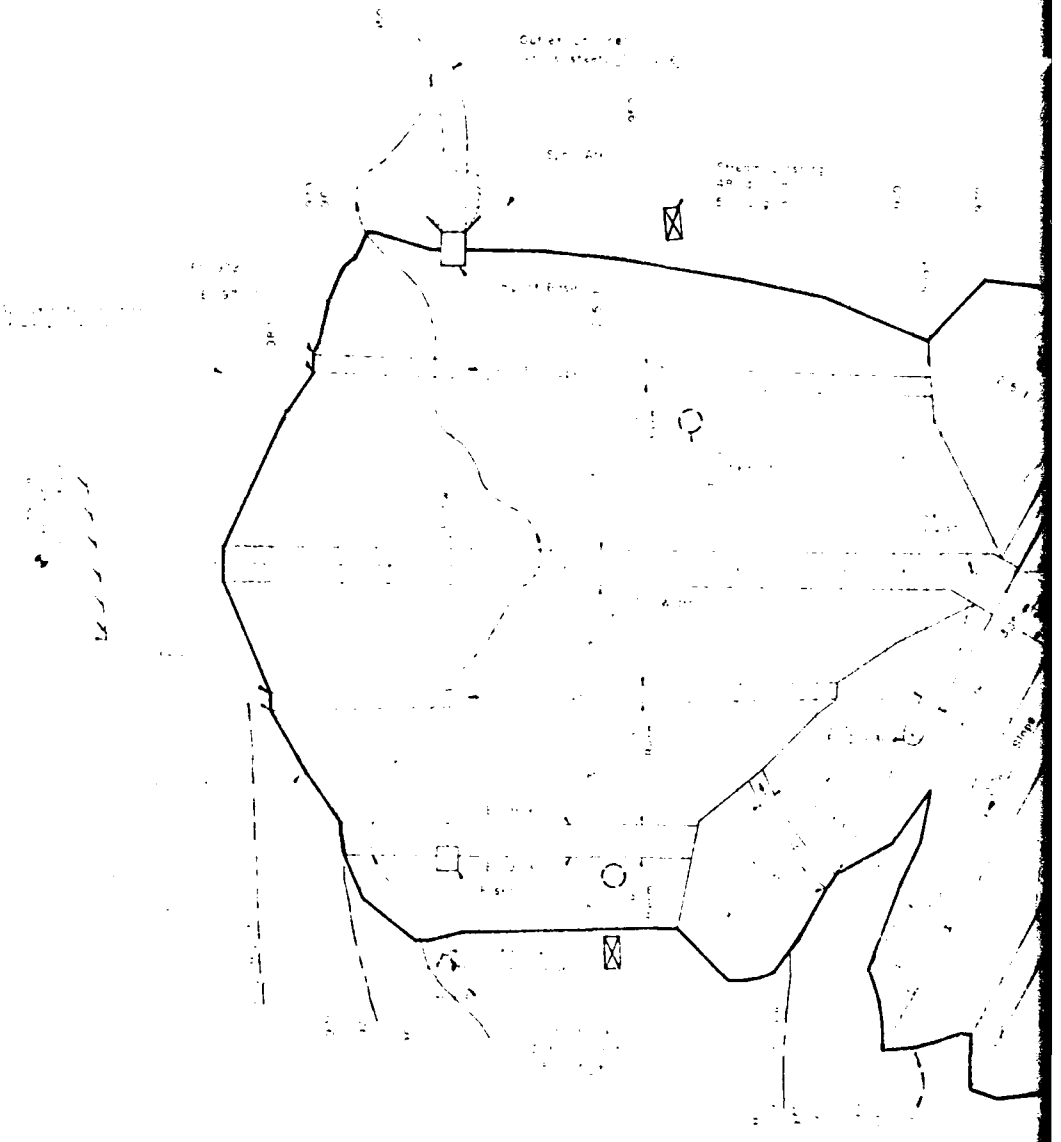


PLATE 2

WATERSHED MAP



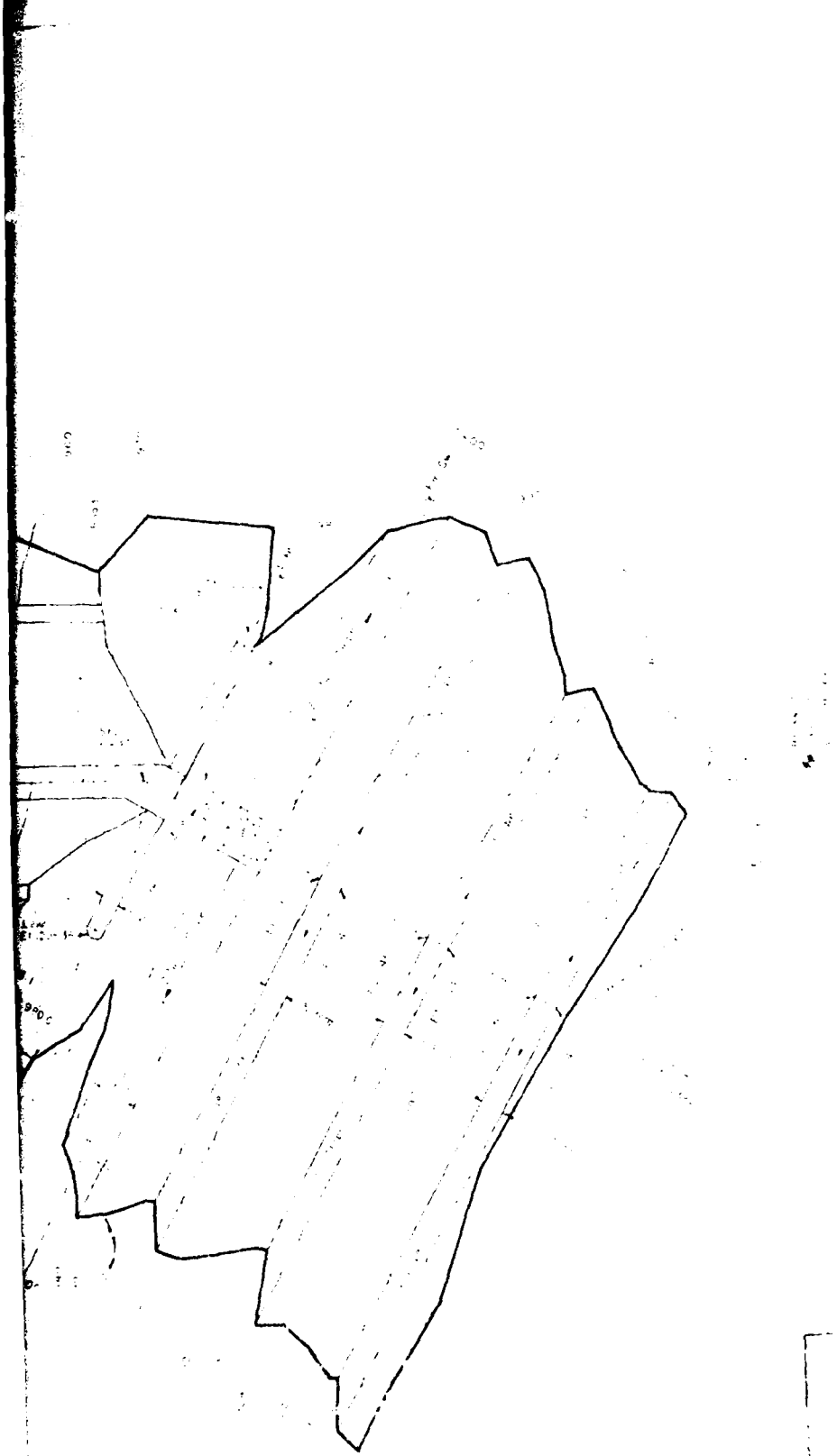
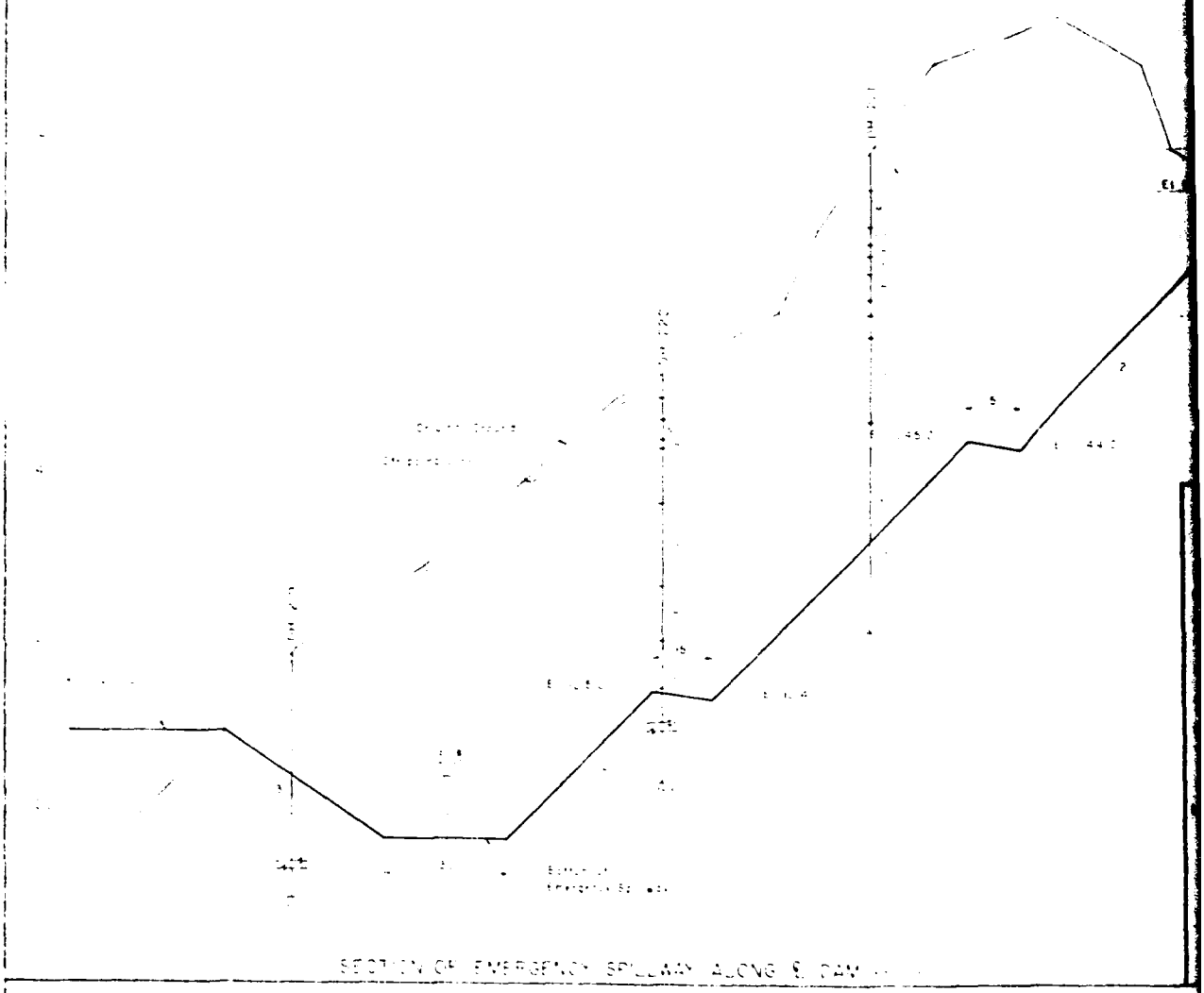
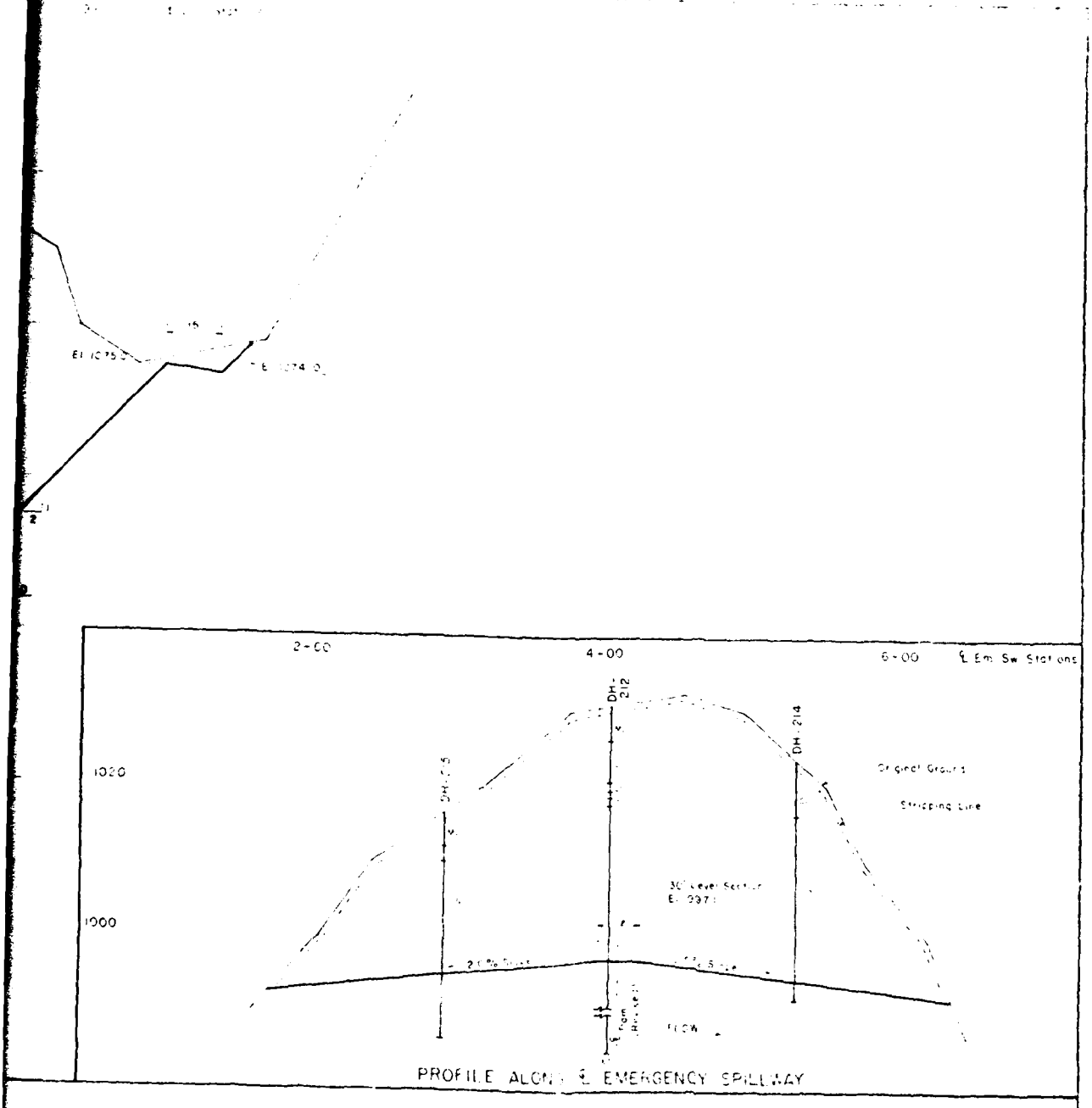


PLATE 3



SECTION OF EMERGENCY SPILLWAY ALONG E. DAM



PROFILE ALONG ℄ EMERGENCY SPILLWAY

PLATE 4

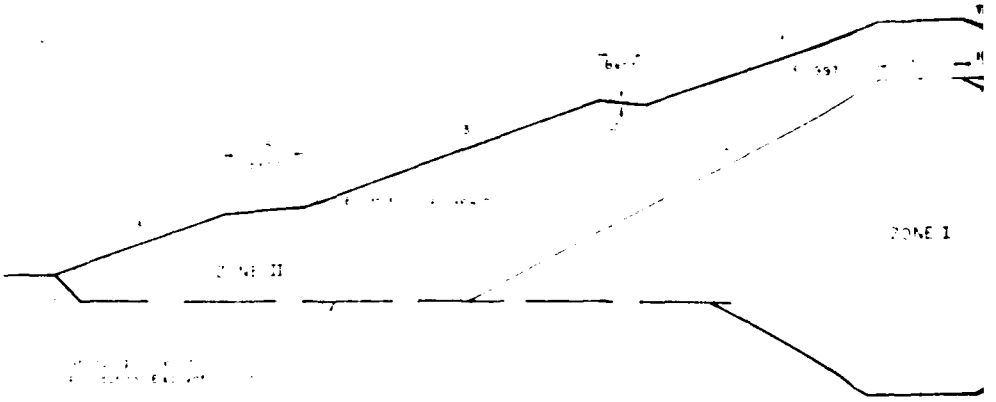
HARMON CREEK WATERSHED

FLOOD WATER RETARDING DAM NO. 4A
WASHINGTON COUNTY, PENNSYLVANIA

EMERGENCY SPILLWAY

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

2



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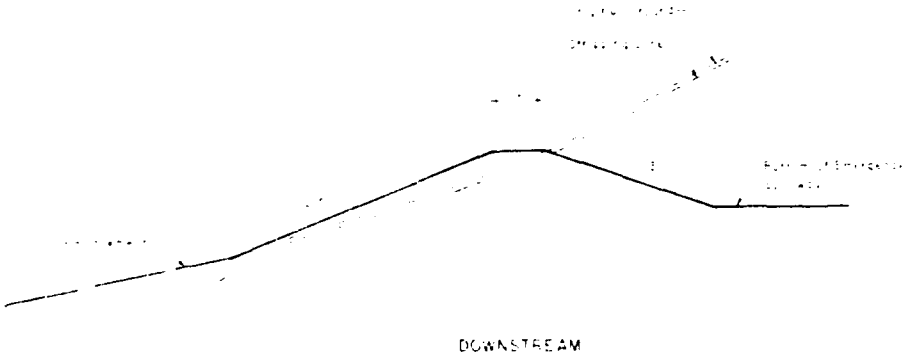

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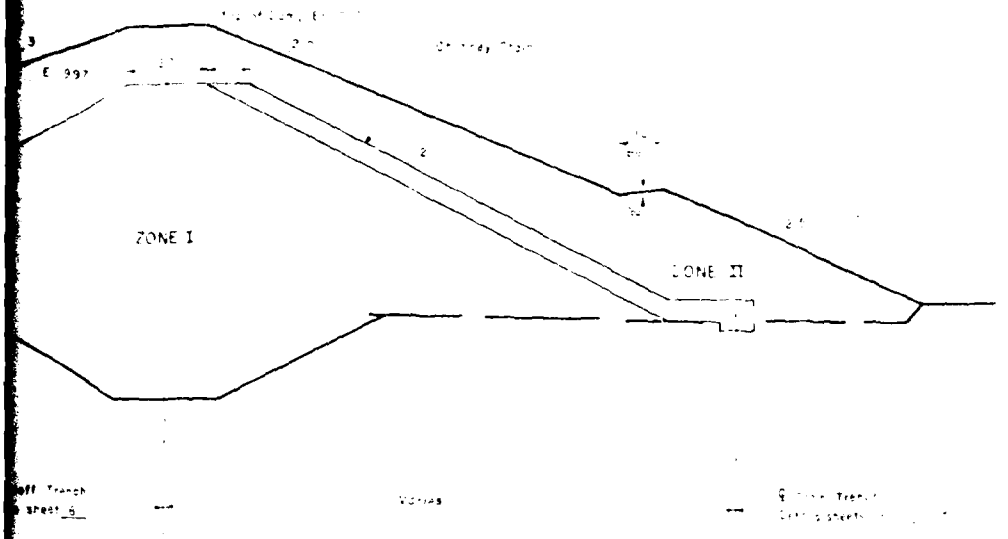
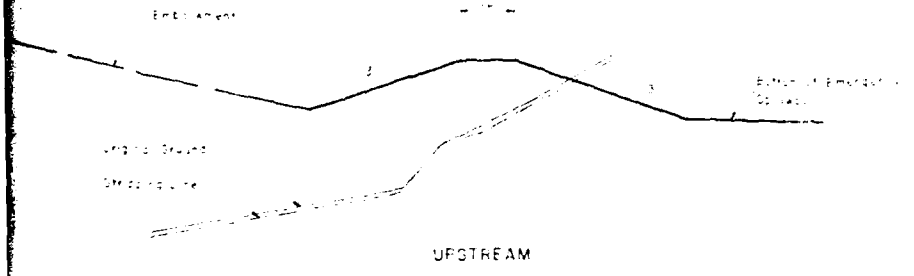
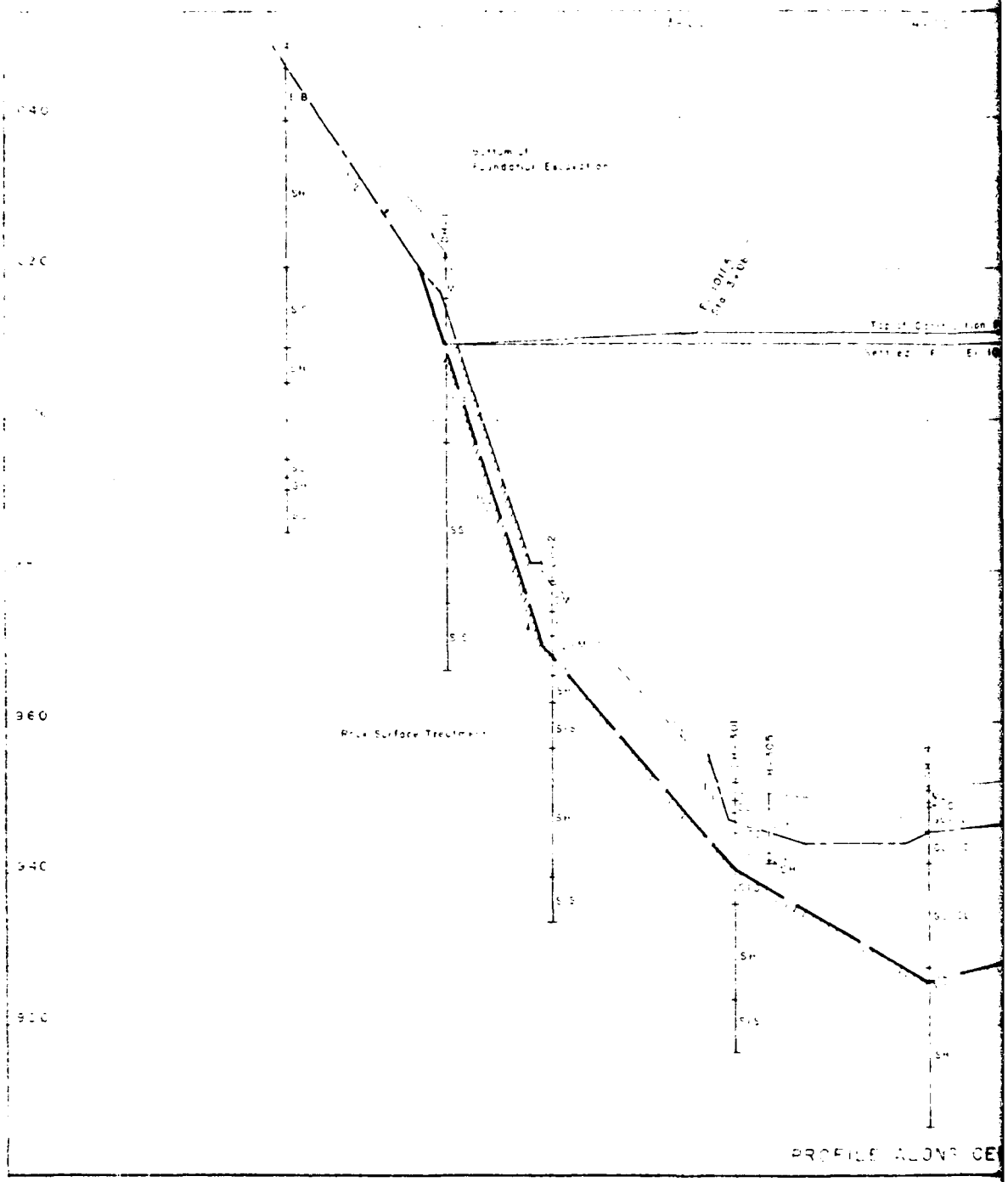


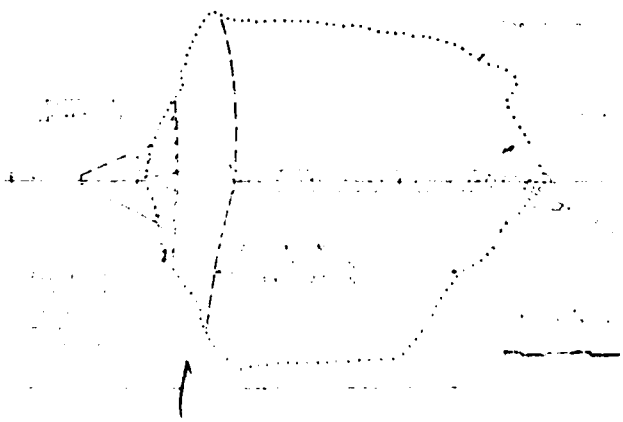
TYPICAL SECTION OF DAM

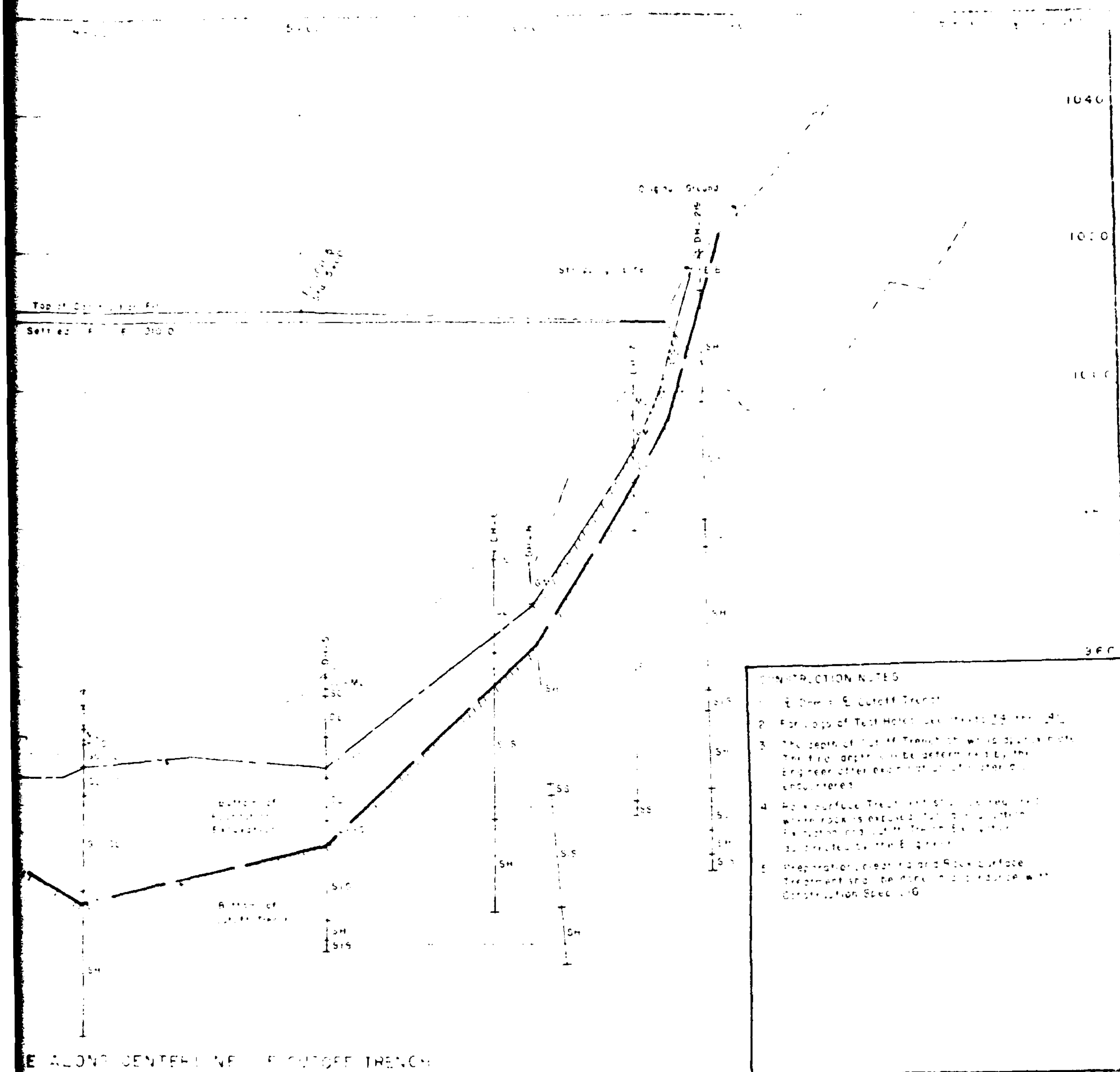


TYPICAL SECTION OF DIKES

PLATE 5


Bottom of
Foundation Excavation
Rock Surface Treatment
PROFILE ALONG CE





CONSTRUCTION NOTES

1. ℄ Dam = ℄ Cutoff Trench
2. For Logs of Test Holes see [illegible]
3. The depth of Cutoff Trench [illegible] The final depth will be determined by the Engineer after [illegible] encountered.
4. Rock Surface Treatment [illegible] where rock is exposed [illegible] as directed by the Engineer.
5. Preparation, Cleaning and Rock Surface Treatment shall be done in accordance with Construction Spec. [illegible]G

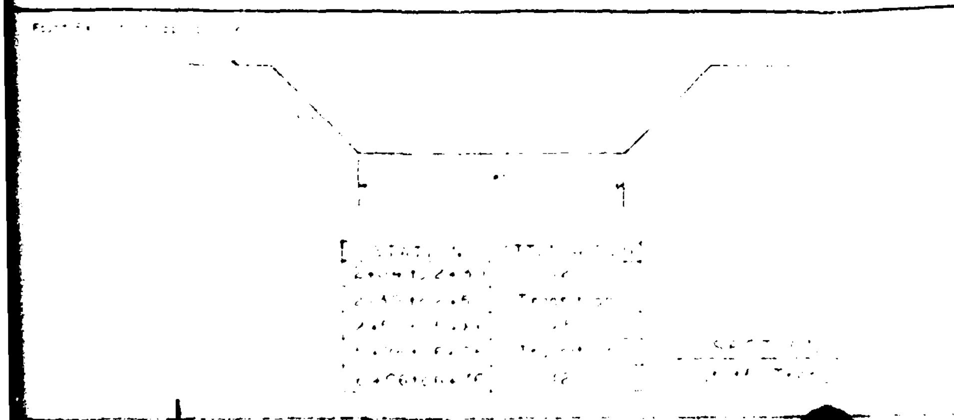
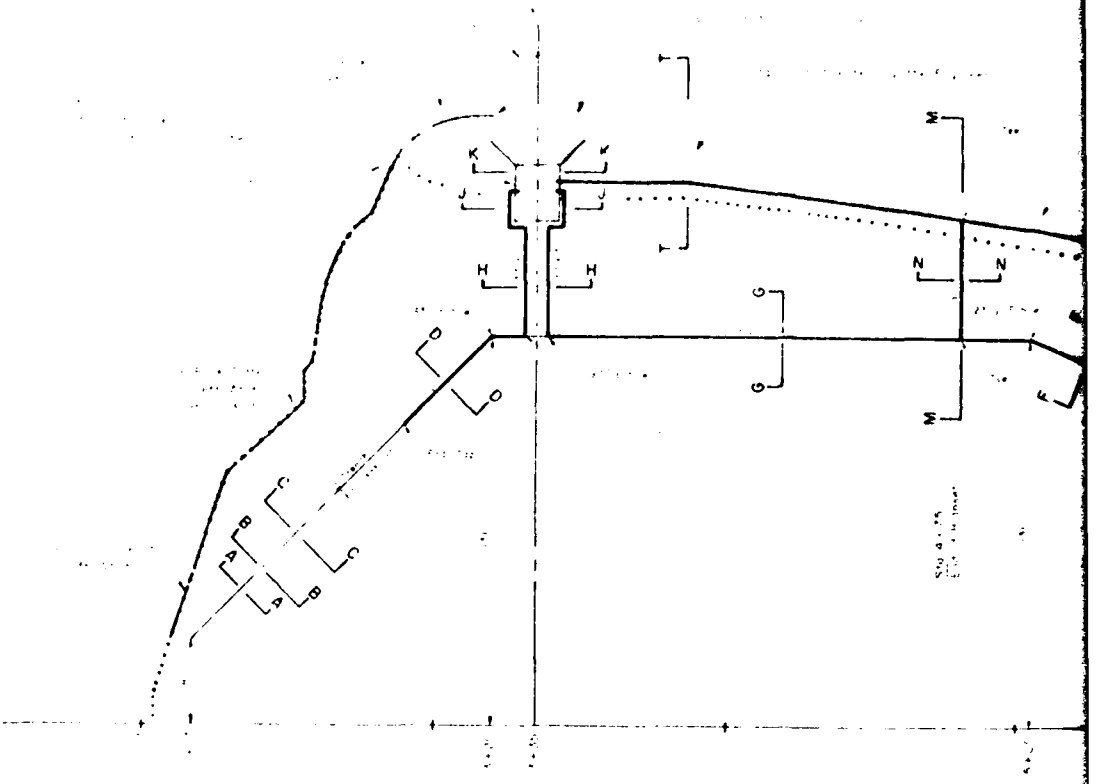


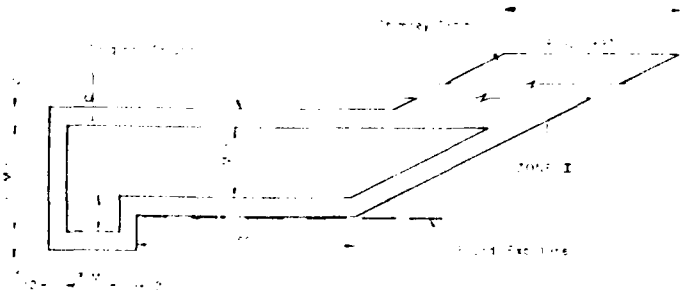
PLATE 6

HARMON CREEK WATERSHED
[illegible]

2

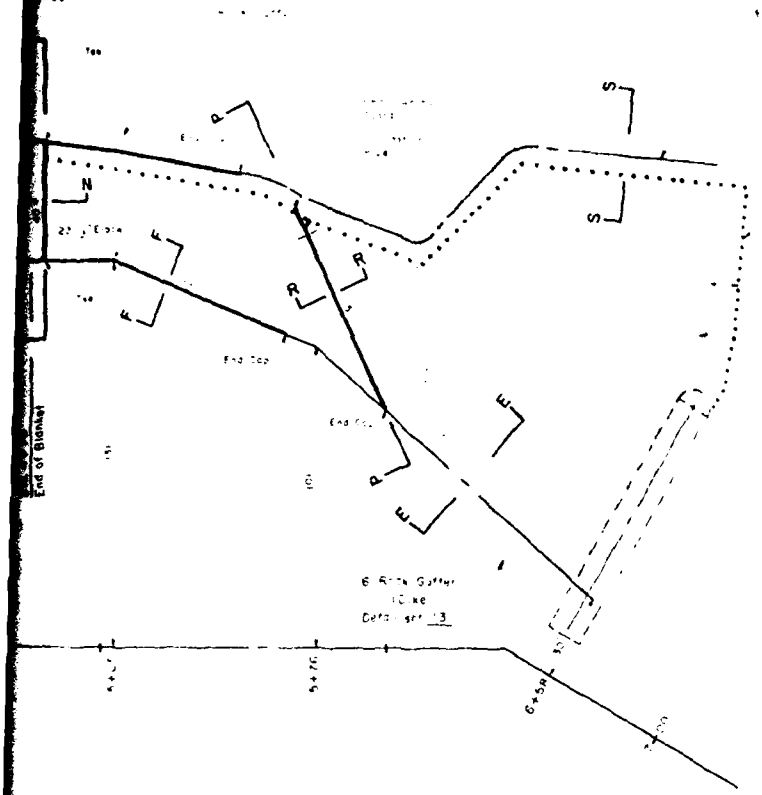


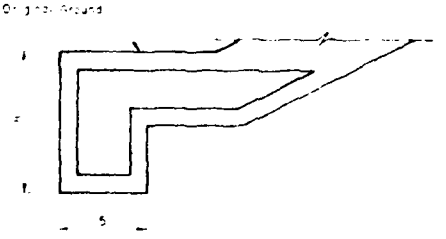
PLAN VIEW



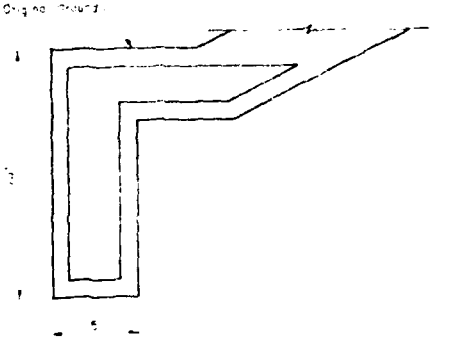
SECTION A-A

CONSTRUCTION NOTES





SECTION B-B



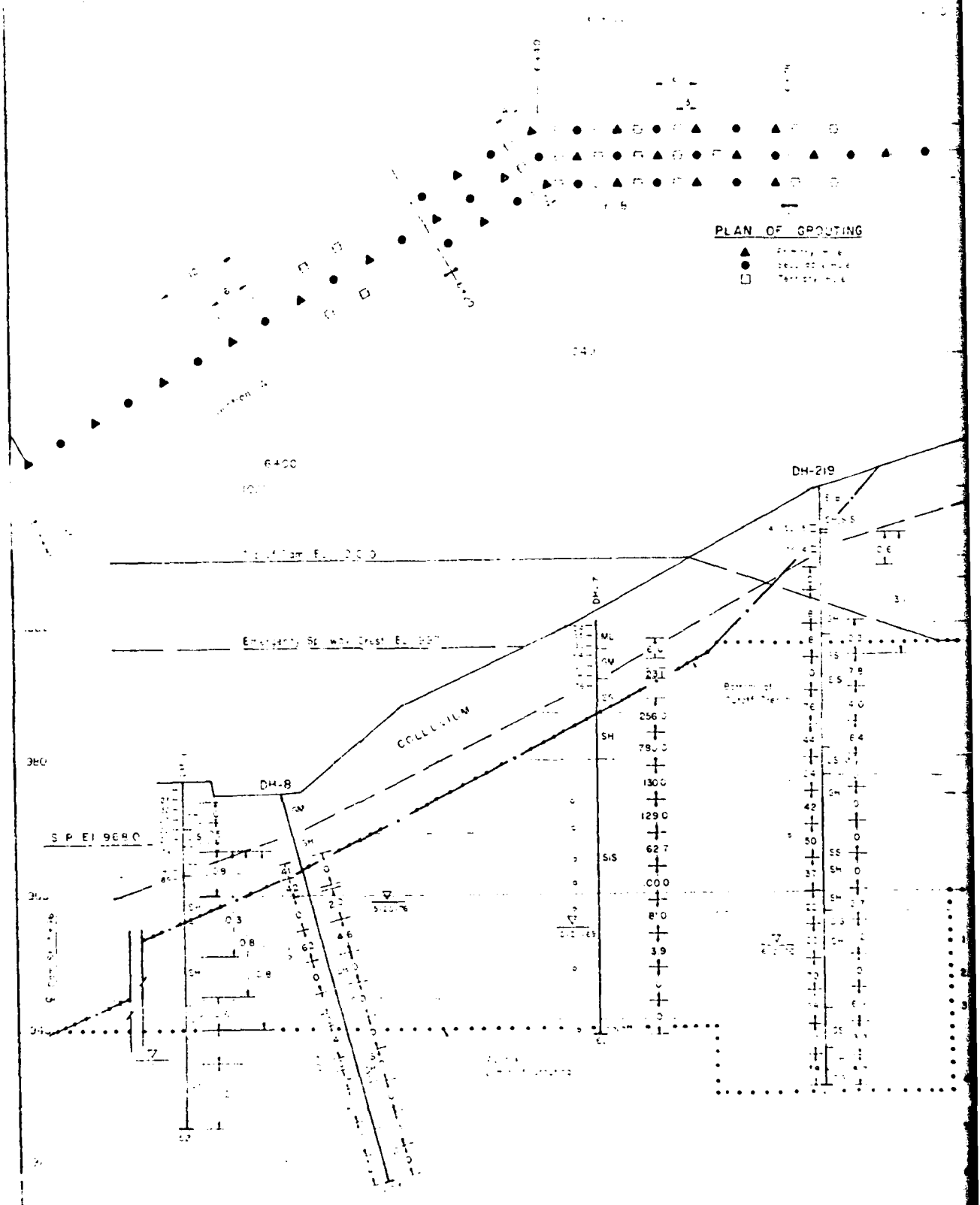
SECTION C-C

QUANTITY SUMMARY

PLATE 7

HARMON CREEK WATERSHED

3



PROFILE CENTERLINE OF DAM, EMERGENCY SPIL

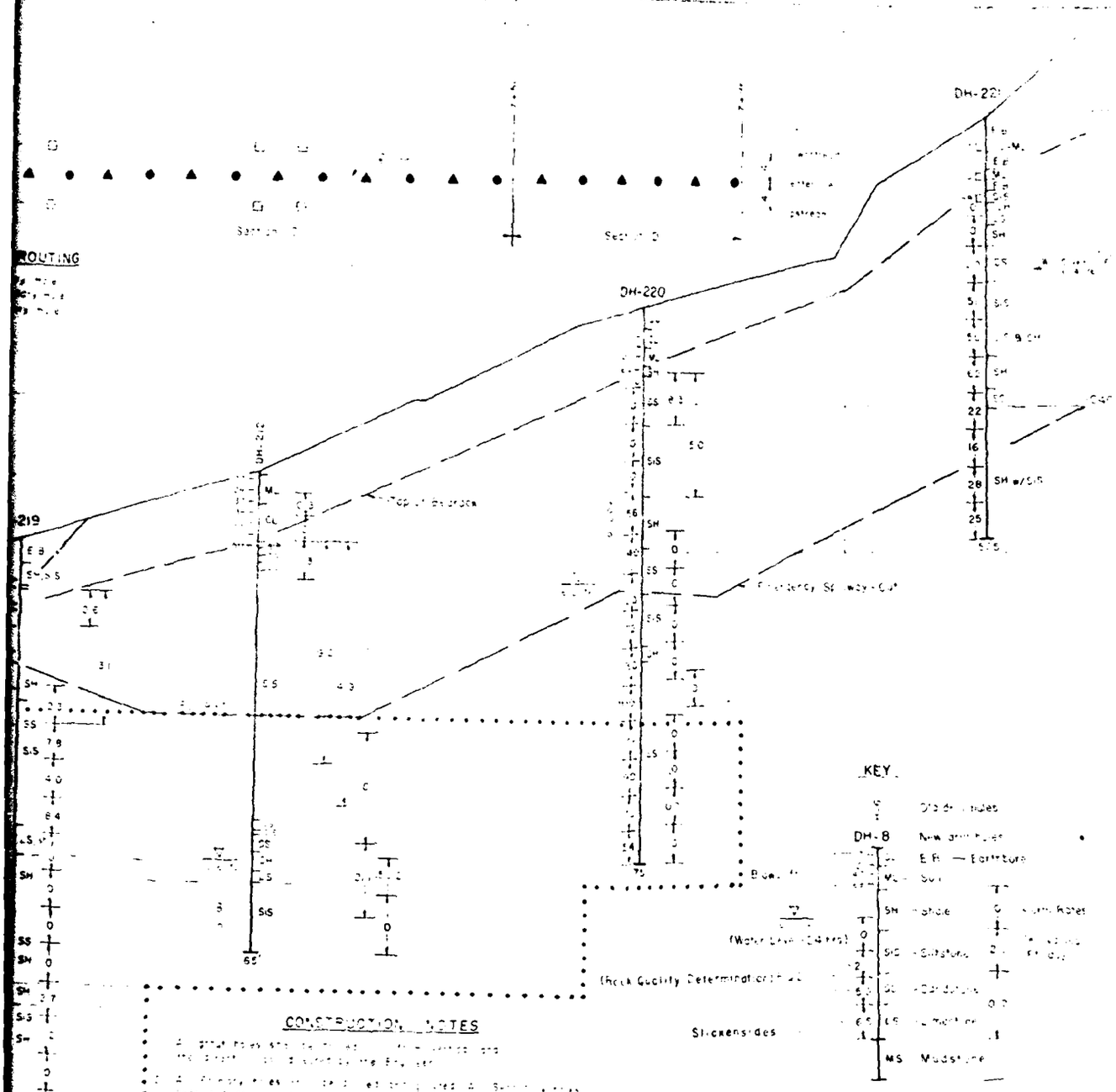


PLATE 8

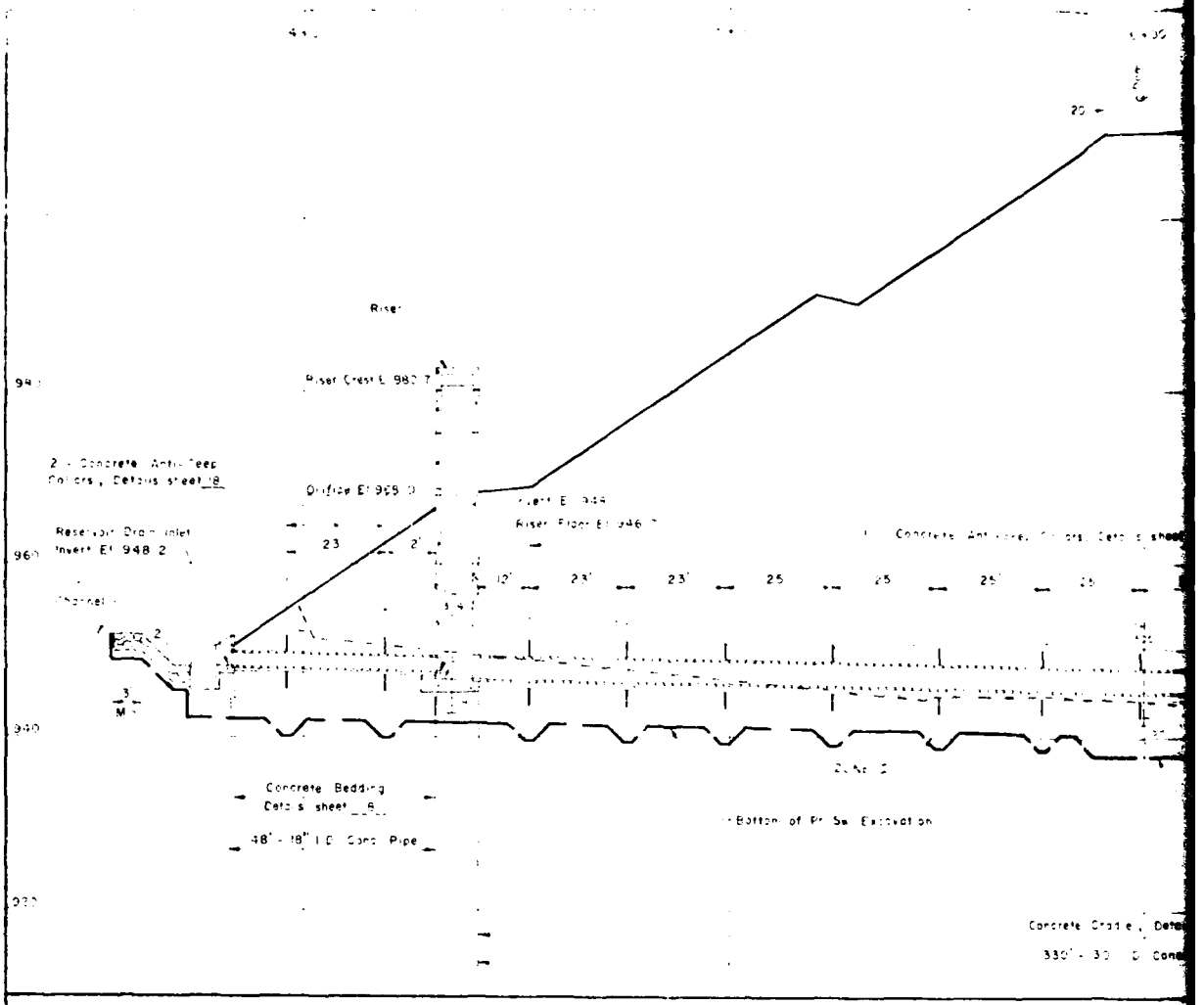
HARMON CREEK WATERSHED

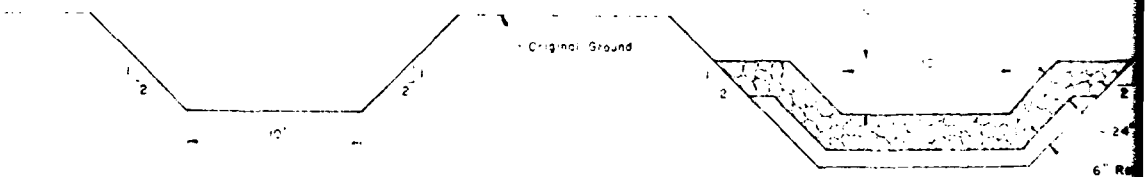
FLOODWATER RETARDING DAM NO. 4A
WASHINGTON COUNTY, PENNSYLVANIA

GROUTING

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

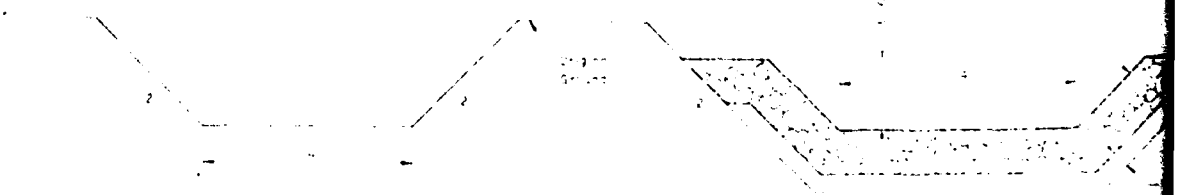
2





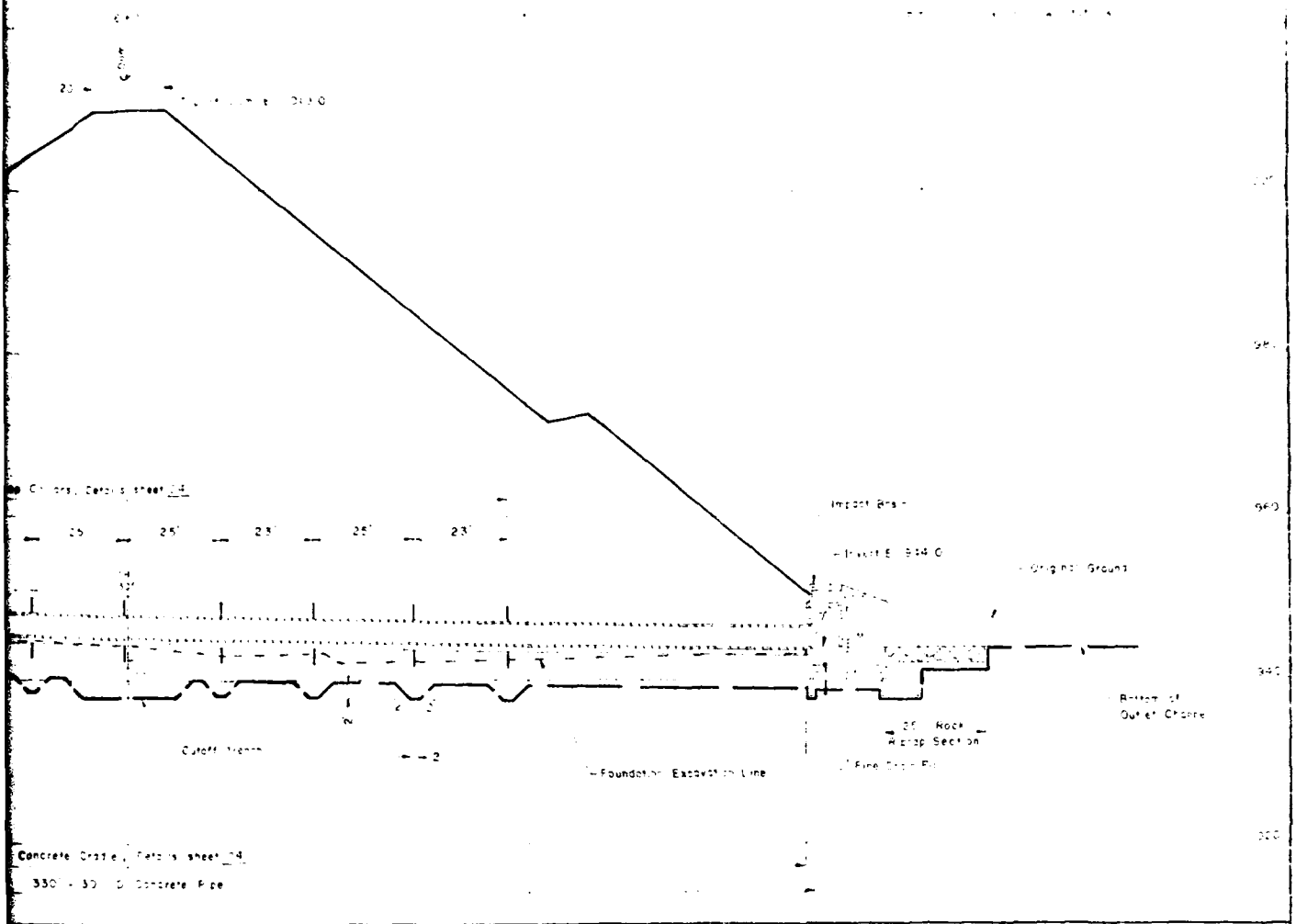
INLET CHANNEL

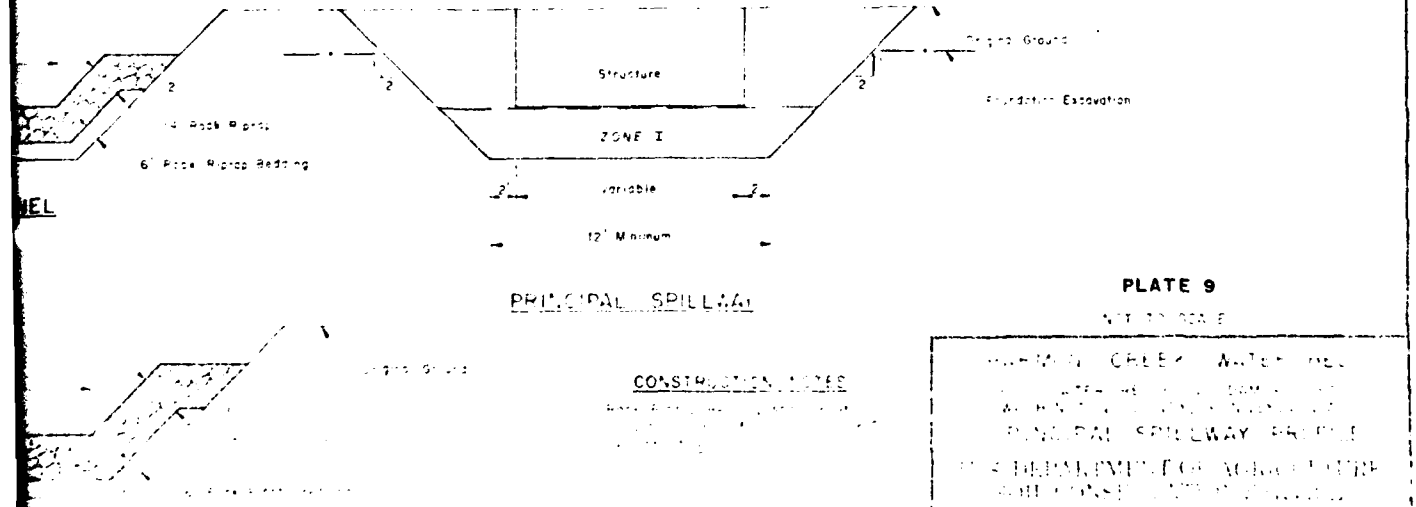
INLET CHANNEL



OUTLET CHANNEL

OUTLET CHANNEL

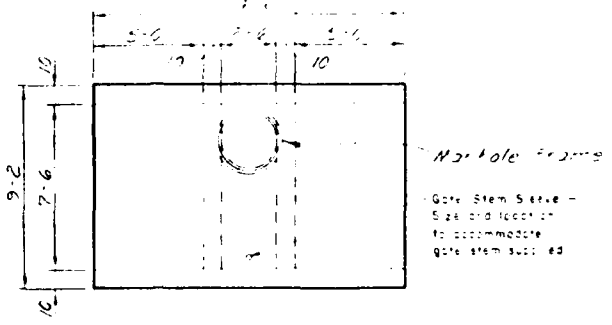




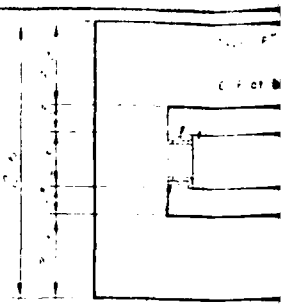
PRINCIPAL SPILLWAY

CONSTRUCTION NOTES

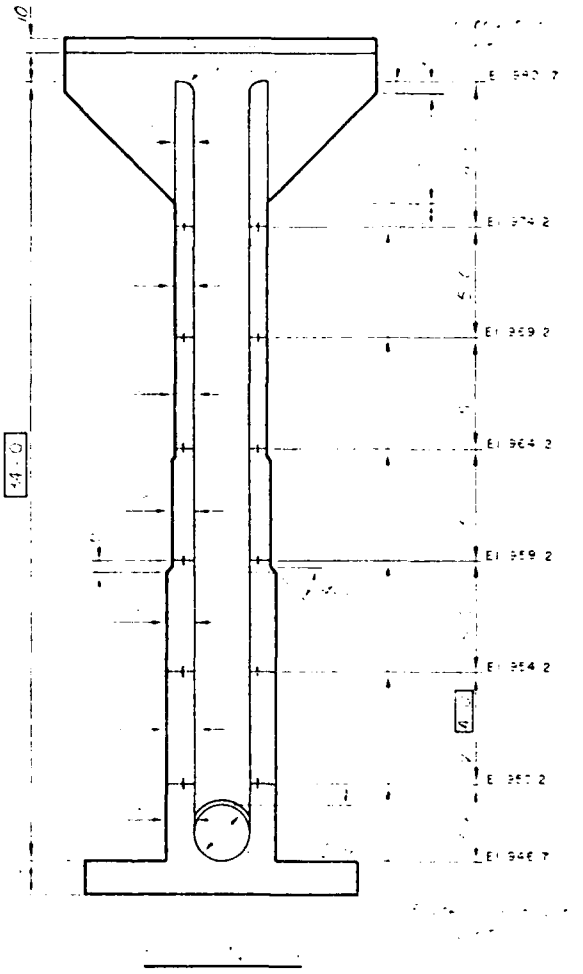
PLATE 9

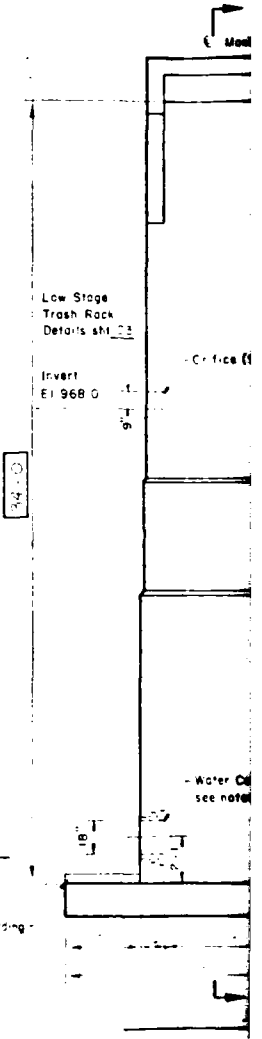


PLAN - TOP



Bell and Flange Wall Fitting –
Detail sheet 8





STANDARD COVERED RISER

STANDARD

DATE

4

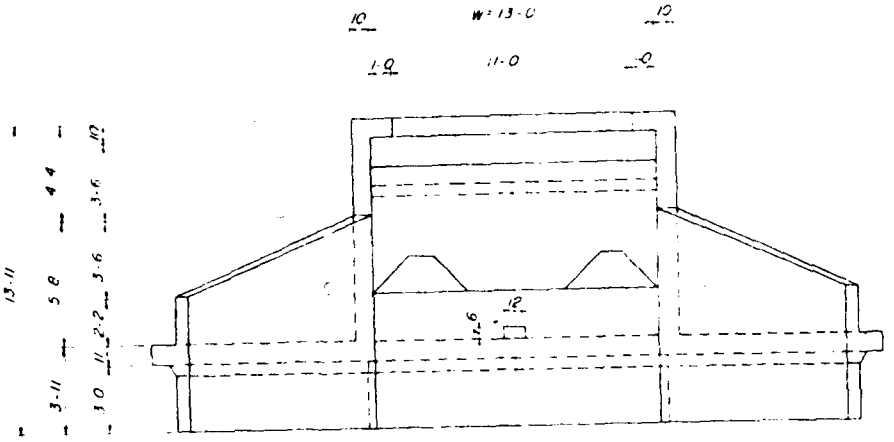
PLATE
CONSTR JOINT

CONSTR JOINT

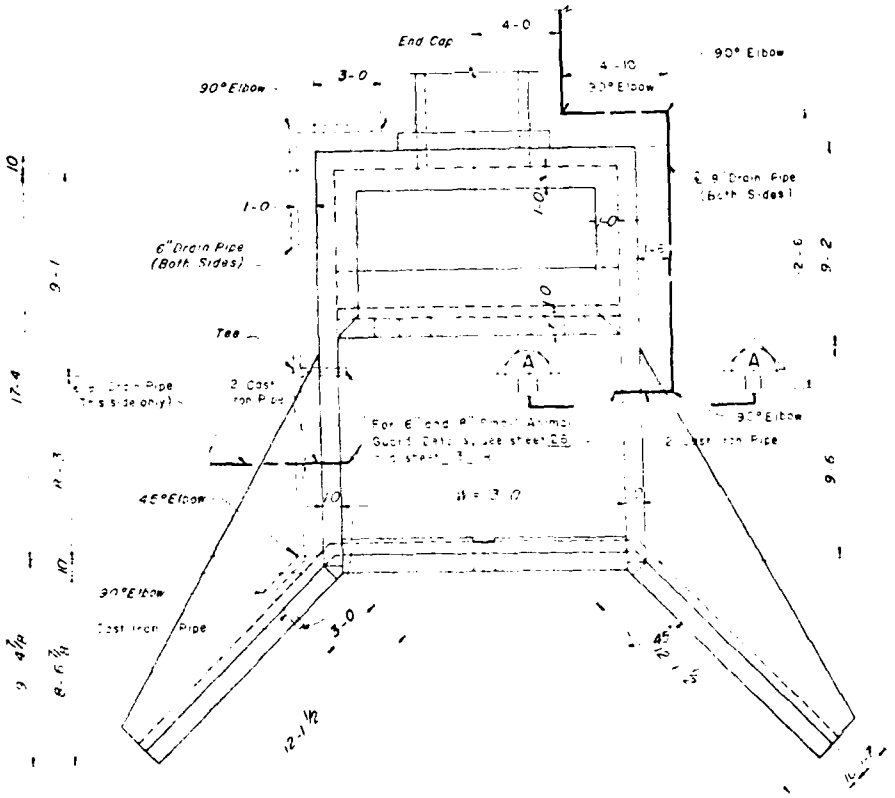
PLATE 10

HARMON CREEK WATERSHED

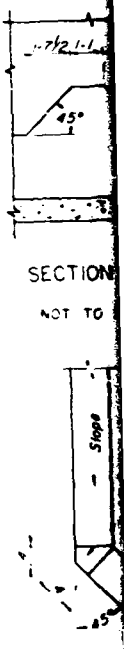
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



DOWNSTREAM ELEVATION



PLAN

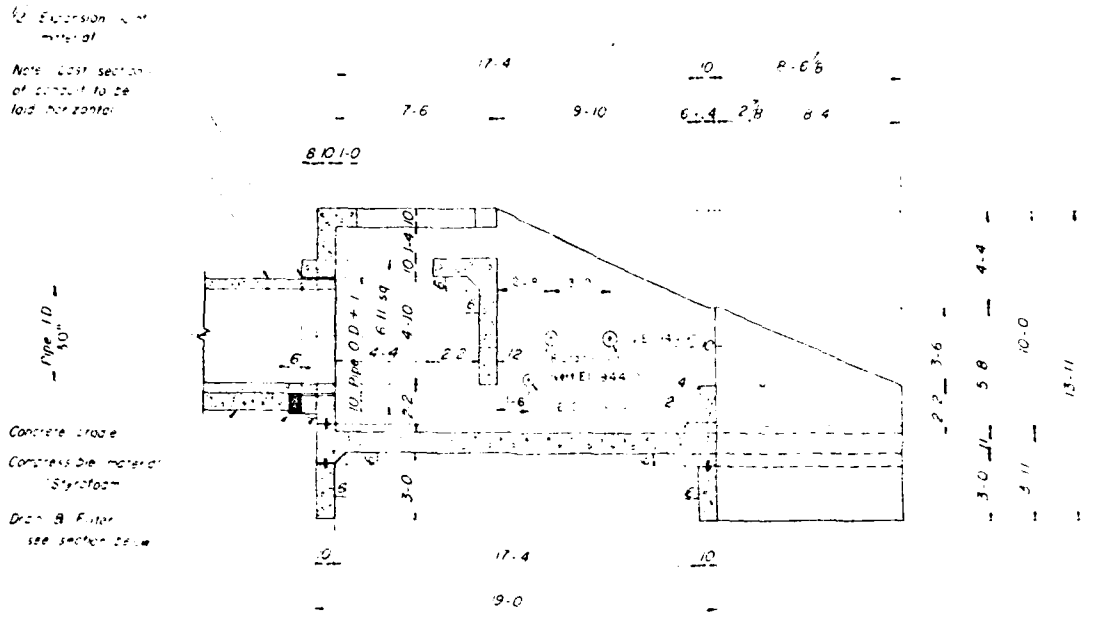


SECTION

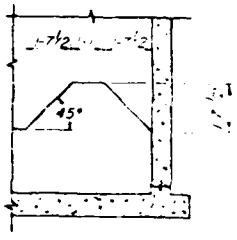
NOT TO

BASIN

SCALE IN FEET
EXCEPT AS NOTED



SECTION ON CENTERLINE



SECTION A
1:1
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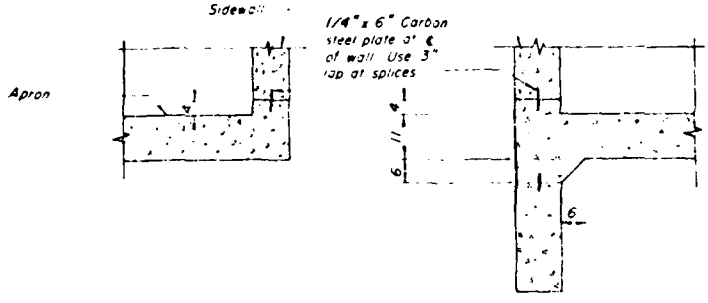
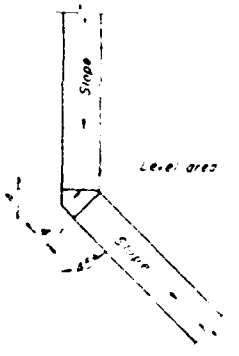


CONSTRUCTION JOINT DETAILS
NOT TO SCALE

PLATE II

QUANTITIES

Formwork — Surface area — 1900 Sq. Ft.
Reinforced Concrete — Class AC (P) — 45 Cu. Yds.
Reinforcing Steel — 6,45[illegible] Lbs.
Cradle — [illegible]
[illegible] Pipe, Perforated, Asbestos-Cement, Type II, Class SN, Rubber Gasket — [illegible] Linear Ft.
[illegible] Cast Iron Pipe, [illegible] — [illegible]
Drain pipe 45° tees — 2
Drain pipe 90° ells — 4
Drain pipe 45° ells — 1
Steel Drain Grate — 3
[illegible] Pipe — 1
Castings
1/4" x 6" Carbon steel plate, Structural grade — 76 lbs.



PLAN - JUNCTION SIDEWALL AND APRON

HARMON CREEK WATERSHED
[illegible]
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

NOTES

2

APPENDIX F

REGIONAL GEOLOGY

PA 480
NDI No. PA 01125, PennDER No. 63-84, SCS No. PA 480

REGIONAL GEOLOGY

PA 480 Dam is located in the Pittsburgh Plateaus Section of the Appalachian Plateaus Physiographic Province. Bedrock units below the dam are contained in the Casselman formation of the Conemaugh group, Pennsylvanian system. The Casselman formation consists of cyclic sequences of sandstone, shale, redbeds, and thin limestone and coal.

The Pittsburgh coal (base of Monongahela group) is located in the emergency spillway at approximate Elevation 1073 feet M.S.L. The Pittsburgh coal is approximately six feet thick in the area and has been strip mined immediately above the emergency spillway on the right abutment. The lower half of the spillway is in the Pittsburgh limestone member of the Conemaugh group and consists of thin limestone and sandstone zones and fractured and jointed shales and siltstones. The abutments are composed of the Connellsville, Clarksburg, and Morgantown members of the Conemaugh group. The Connellsville sandstone is exposed on the left abutment and shows jointing and fracturing. High permeabilities were noted during the exploration program in the Connellsville sandstone and the bedrock of the Connelsville sandstone member along the centerline of the dam in the right abutment and below the emergency spillway cut was grouted during construction. The bedrock below the floodplain consists of shales and sandstones of the Morgantown member.

The abutment soils consist of residual and colluvial gravels, silts, and clays. In the floodplain, alluvial, residual, and some colluvium were present to a maximum depth of 25.5 feet. These soils included clayey silts, silty and gravelly clays, and clayey gravels.

A regional geologic map and legend are presented on the following pages. Additional site geology can be obtained by reviewing the "Detailed Geologic Investigation Report" in the SCS design folder for this dam.

GEOLOGIC MAP
PA 480
NDI No. PA 01125, Washington County

Reproduced from
Greater Pittsburgh Region Geologic Map,
Compiled by W. R. Wagner and others, 1975

Scale: One Inch Equals Approximately Two Miles
See Legend, Next Page

GEOLOGY MAP LEGEND

GROUP	FORMATION		DESCRIPTION
	Alluvium	Qt	Sand, gravel, clay.
	Terrace deposits		Sand, clay, gravel on terraces above present rivers; includes Carmichaels Formation.
DUNKARD	Greene		Cyclic sequences of sandstone, shale, red beds, thin limestones and coals.
DUNKARD	Washington	Pw	Cyclic sequences of sandstone, shale, limestone, and coal; contains Washington coal bed at base.
DUNKARD	Waynesburg		Cyclic sequences of sandstone shale, limestone and coal; contains Waynesburg coal bed at base.
MONONGAHELA		Pm	Cyclic sequences of shale, limestone, sandstone and coal; contains Pittsburgh coal bed at base.
P. CONEMAUGH	Casselman	Pcc	Cyclic sequence of sandstone, shale, red beds and thin limestone and coal.
P. CONEMAUGH	Ames		
P. CONEMAUGH	Glenshaw	Pcg	Cyclic sequences of sandstone, shale, red beds and thin limestone and coal; several fossiliferous limestone; Ames limestone bed at top.
ALLEGHENY	Vanport	Pa	Cyclic sequences of shale, sandstone, limestone, and coal; contains Brookville coal at base and Upper Freeport coal at top; within group are the commercial Vanport limestone and Kittanning and Clarion coals.
ALLEGHENY	Vanport	Pa	
POTTSVILLE		Pp	Sandstone and shale; contains some conglomerate and locally mineable coal.
Mauch Chunk		Mm	Red and green shale with some sandstone; contains Wymps Gap and Loyalhanna limestones.
Pocono			Sandstone and shale with Burgoon sandstone at top.